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TAX POLICY AND ADMINISTRATION

The Research Tax Credit Has Stimulated Some Additional Research Spending

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The Honorable Dan Rostenkowski
Chairman, House Committee on Ways and Means
House of Representatives

The Honorable Lloyd Bentsen
Chairman, Senate Committee on Finance
United States Senate

The Honorable Brian Donnelly
House of Representatives

This report responds to a request to review the research and experimentation tax credit and a legislative requirement to study the credit's structure and effectiveness. The report discusses IRS' administration of the credit, the effectiveness of the credit in stimulating additional business research spending, and potential changes to the credit's structure that could increase its effectiveness.

We are sending copies of the report to the Secretary of the Treasury, the Commissioner of Internal Revenue, and other interested parties upon request.

Major contributors to this report are listed in appendix VIII. If you have any questions, please call me on (202) 275-6407.

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Executive Summary

Purpose

In 1981, Congress enacted a temporary research and experimentation tax credit. Lawmakers wanted to provide an incentive for businesses to invest in research because they were concerned about the competitiveness of American firms. Congress has renewed the credit twice. It is scheduled to expire December 31, 1989.

This report responds to a December 1987 request from Congressman Brian Donnelly and the mandate in the Technical and Miscellaneous Revenue Act of 1988. The act required GAO to report on the operation of the credit, its effectiveness, and alternatives to the credit's current structure.

Background

Beginning July 1981, taxpayers could reduce their tax liability by 25 percent of qualified research and experimentation expenditures that exceeded a base amount. Qualified expenditures are for product innovation, but not product development. The base amount is equal to the taxpayer's most recent 3-year average of qualified expenditures or 50 percent of the taxpayer's current year expenditures, whichever is greater. Congress designed the credit to stimulate additional research spending.

The credit, never a permanent part of the tax code, expired on December 31, 1985, but was reenacted by the Tax Reform Act of 1986 and made retroactive to January 1, 1986. The 1986 act, however, modified the credit by (1) reducing the rate to 20 percent and (2) more narrowly defining qualified expenditures. The credit was again reenacted in November 1988. It was unchanged except that taxpayers must reduce their deductions for research expenses by an amount equal to 50 percent of the credit they claim.

Current congressional and administration proposals would change various features of the credit. The major change would replace the moving-average base with a base that would initially be computed as the taxpayer's average spending over a fixed period (1984 through 1988) and then be indexed to the growth in the Gross National Product (GNP). Another change would allow taxpayers to use an optional credit with a lower rate and a smaller base.

As with other business tax credits, the research credit is primarily used by large corporations. Between 1981 and 1985, corporations with assets of $250 million or more claimed about 80 percent of the credit, or $4.7 billion.

Results in Brief

GAO estimates that the credit stimulated between $1 billion and $2.5 billion of additional research spending between 1981 and 1985 at a cost of $7 billion in tax revenues. Thus, each dollar of taxes foregone stimulated between 15 and 36 cents of research spending. Although the amount of spending stimulated by the credit was well below the credit's revenue cost, total benefits may be much higher. If, as many presume, research activities are more beneficial to society than nonresearch activities, the credit may still be sound tax policy.

The credit could provide more of an incentive if the moving-average base were replaced with a fixed base indexed to the growth in GNP or another indexing factor. Assuming companies' patterns of research spending are similar to those of the early 1980s, the "effective rate" of the proposed credit—the actual tax benefit that a company receives for spending an additional dollar on research—would be about 14 percent instead of below 4 percent as it is under the current credit. To ensure that the credit continues to provide an attractive incentive to most taxpayers at an acceptable revenue cost, the base and index should be reviewed periodically and adjusted as needed.

The Internal Revenue Service (IRS) administers the research and experimentation tax credit primarily through corporate audits. From a survey of IRS revenue agents, GAO concluded that the current credit is relatively difficult for IRS to administer. IRS questioned the credit claimed by 79 percent of the corporations that had their credit audited. The amount questioned represented 20 percent of the amount of credit claimed. However, some corporations have appealed the amounts IRS questioned. Many revenue agents reported that the definition of qualified research expenses was unclear. The Treasury recently issued regulations that should help resolve such definitional questions. Consequently, it is premature at this time to suggest legislative changes to make the credit easier to administer.

GAO's Analysis

Effectiveness of the Credit

GAO analyzed income tax return data for a sample of 800 corporations with assets over $250 million. The analysis showed that the research and experimentation credit provided some incentive to increase spending. Because the credit is earned only for increases in research spending above a moving-average base, the effective rate of the credit is well

below 20 percent; GAO estimated the rate to be about 4 percent for 1981 through 1983. The credit is calculated in such a manner that a company's decision to spend an additional dollar on research in a given year generally increases the amount of credit that the company earns that year but decreases the credit earned in 3 succeeding years. As a result, the effective rate provided by the credit depends on a company's pattern of spending over several years and can vary considerably across firms. The effective rate measures the reduction in the price of a unit of research due to the credit. By combining GAO's estimates of the average effective rate of credit with estimates of firms' responsiveness to price reductions, GAO estimated the stimulative effect of the credit to be $1 billion to $2.5 billion in additional research spending between 1981 and 1985. (See pp. 24-29.)

Structure of the Credit

GAO concluded that the greatest potential for improving the credit's stimulative effect lies in modifications that would (1) break the link between current spending and future base expenditures and (2) make the base more accurately reflect the research spending that would have occurred without the credit. For example, replacing the 3-year moving-average base with a fixed base, indexed to the growth in GNP, would substantially increase the average incentive provided per dollar of revenue cost. This revision would break the link between taxpayers' current spending and the amounts of credit they earn in future years. The average incentive of such a credit would depend on the distribution of research spending across companies—how much research spending is done by companies that are rapidly increasing their spending above previous years compared to spending by companies that are only modestly increasing, or even reducing, their spending. If the distribution remains similar to what it was in 1985, the effective rate of credit would be about 14 percent instead of below 4 percent as it is under the current credit. Of course, future growth in research spending may differ from its earlier pattern, affecting the long-run revenue cost and average incentive. (See pp. 31-48.)

GAO's analysis also showed that other proposed changes to the credit will involve tradeoffs among the objectives of (1) providing each taxpayer a significant incentive, (2) making this incentive available to as many taxpayers as possible, and (3) keeping the revenue cost at an acceptable level. For example, retaining a minimum base period amount of 50 percent of current year expenditures could play a critical role in containing the revenue cost of the credit. However, this would reduce the incentive for companies that are rapidly increasing their research

expenditures. GAO's analysis showed that additional revenues could be saved by modifying the proposed credit to reduce the amount of credit earned for expenditures taxpayers would have made without the credit. The tradeoff for this modification is to reduce the credit's incentive for a relatively small number of taxpayers. (See pp. 48-51.)

Administration of the Credit

IRS routinely audits the research credit as part of its special program auditing the largest corporations. From a GAO survey of IRS revenue agents who had recently completed such audits, GAO estimates that (1) IRS audited about 74 percent of the large corporations claiming the credit, (2) these corporations claimed about $1.8 billion of credits, and (3) the audits resulted in adjustments to the credit for 341 corporations, or 79 percent of those that had their credit audited. In these audits, IRS disallowed an estimated $368 million of credit claimed by 303 companies and allowed an additional $7 million of credit for 38 companies. (See pp. 18-19.)

The GAO survey showed that revenue agents most frequently cited corporations claiming unqualified expenditures as the reason for adjusting the credit. The types of unqualified expenditures revenue agents reported as being either difficult or very difficult to audit were expenditures for adapting existing capability, routine or cosmetic alteration, overhead and administration, and ordinary testing. Overall, about a fifth of the agents reported that the definition of qualified expenditures was unclear. In May 1989, Treasury reproposed regulations that should help clarify the definition of qualified expenditures. (See pp. 20-21.)

Recommendations

GAO is not making any recommendations.

Agency Comments

GAO discussed the information contained in this report with responsible officials at IRS and Treasury. They suggested some technical clarifications, which were made to the report.

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Abbreviations

BMF	Business Master File
EIN	employer identification number
ERC	effective rate of credit
GNP	gross national product
IRS	Internal Revenue Service
NSF	National Science Foundation
QSWC	qualified R&E expenditures without the credit
R&D	research and development
R&E	research and experimentation
RTF	Returns Transaction Files
SEC	Securities and Exchange Commission
SOI	IRS' Statistics of Income Division

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Introduction

In 1981, Congress created the research and experimentation (R&E) tax credit to encourage more businesses to do research. It believed that an increase in research was necessary to enhance the overall competitive position of the U.S. economy. The credit currently reduces a taxpayer's tax liability by 20 percent of the amount of its additional research expenditures above a base amount. Congress has extended the credit twice. It is scheduled to expire December 31, 1989.

This report is in response to two initiatives. First, Congressman Brian Donnelly asked us to study the Internal Revenue Service's (IRS) administration of the research credit and the effectiveness of the credit.[1] Second, after we began that study, Congress enacted the Technical and Miscellaneous Revenue Act of 1988. That act and its conference report require that we report to Congress by December 31, 1989, on the operation, effectiveness, and structure of the credit, including alternatives to the credit's current structure.

Claiming the Research Tax Credit

Section 41 of the Internal Revenue Code[2] allows taxpayers to claim a tax credit for additional investments in qualified research incurred "in carrying on" a trade or business. Qualified research expenditures, in general, include (1) in-house expenditures for wages paid for qualified research services and supplies used in research, (2) 65 percent of the payments made for contract research done on the taxpayer's behalf, and (3) payments for the right to use computers in research. Appendix I provides a more detailed description of the types of activities covered by the credit.

The credit originally was enacted by the Economic Recovery Tax Act of 1981 (Public Law 97-34, 95 Stat. 172 [1981]) with the following provisions:

- The credit equaled 25 percent of the qualified research expenditures that exceeded the base period amount;
- base period amount equaled the previous 3-year average expenditures or 50 percent of current year expenditures, whichever was greater;

[1] In June 1988, we provided the results of our preliminary analysis on this request in our briefing report, Preliminary Analysis of the Research and Experimentation Tax Credit, (GAO/GGD-88-98BR, June 1988).

[2] Of 1986, as amended. As originally enacted, the credit was in section 44F of the Internal Revenue Code of 1954, as amended. The Tax Reform Act of 1984 renumbered the various tax credit sections of the 1954 Code and placed the R&E credit in section 30. The credit later was moved to section 41 by the Tax Reform Act of 1986.

- 3-year carryback, 15-year carryforward;
- effective July 1, 1981, through December 31, 1985; and
- excluded from the definition of qualified research is research done outside the United States, research in the humanities or social sciences, and research funded by a grant, contract, or otherwise by another person or governmental entity.

The Tax Reform Act of 1986 (Public Law 99-514, 100 Stat. 2085 [1986]) targeted the credit at research undertaken to discover information that is technological in nature and that pertains to functional aspects of products. The Tax Reform Act of 1986 made the following revisions to the credit:

- reduced the credit to 20 percent,
- more narrowly defined qualifying expenditures by clarifying that the research must be technological in nature,
- excluded expenses of leasing personal property,
- established a separate 20-percent credit for university basic research,
- made the credit subject to the general business credit limitation,[3] and
- made the credit effective from January 1, 1986, to December 31, 1988.[4]

The credit was extended for 1 year with the same definition by the Technical and Miscellaneous Revenue Act of 1988.

The base period amount is equal to the average qualified expenditures for the 3 previous taxable years, or 50 percent of the current year expenditures, whichever is greater. This 50-percent limit was adopted to prevent a new or fast-growing company from having too large a portion of total research expenditures eligible for the credit in any 1 year. As a result, if research and experimentation expenditures exceed the base period expenditures by more than 100 percent, the credit is actually limited to one-half the statutory rate, as shown in table 1.1.

[3]The business credit is limited to the first $25,000 of a taxpayer's tax liability, plus 75 percent of any liability over $25,000.

[4]The act was passed in October 1986 and made the credit retroactive to January 1986. The 20-percent university basic research credit became effective for taxable years beginning after 1986.

Table 1.1: How the Credit Is Calculated

In 1983, 1984, and 1985, taxpayer spends $100 on qualified research
Average = $100
In 1986, taxpayer spends $600
Base = greater of 3-year average ($100) or 50 percent of current year expenditures ($600 × 50% = $300)
Credit for 1986 = ($600 - $300) × 20% = $60, which is the same as $600 × (20% / 2)
In 1987, taxpayer spends $400
Base = greater of 3-year average ($100 + $100 + $600 = $800 / 3 = $266) or 50 percent of current year expenditures ($400 × 50% = $200)
Credit for 1987 = ($100 - $266) × 20% = $26.80

Also, the amount of credit that can be used is limited by the taxpayer's income tax liability.[3] A taxpayer with no tax liability in the current year can carry the credit back to apply to the prior 3 years' tax liabilities. Any credit that remains after current and past tax liabilities are eliminated cannot be used until the taxpayer generates additional liabilities in later years. Unused credits can be carried forward 15 years. An additional limitation applies to pass-through entities.[4]

Deduction and Credit Allowed on the Same Expenditures

Many R&E expenditures may also be deducted as current expenses or amortized over 60 months or longer under section 174 of the Code. Congress limited this dual benefit effective January 1989 by reducing the amount of research spending that could be expensed or amortized by one-half of the credit claimed.

Deducting Research Expenses Under Section 174

Section 174 of the Code offers taxpayers an option as to how they treat certain funds invested in R&E activities. Taxpayers may elect to capitalize these investments and write off the amounts invested over a minimum 5-year period. Alternatively, taxpayers may elect to deduct on a

[3]For years before 1986, the amount of the usable credit in any year was limited to the taxpayer's income tax liability, as reduced by other nonrefundable credits. For years after 1985, the credit is added to the general business credit and can be taken only against $25,000 plus 75 percent of a taxpayer's regular tax liability in excess of $25,000 or, if less, the amount by which a taxpayer's regular tax exceeds its alternative minimum tax.

[4]A special rule limits the usable credit in the case of an individual owning an interest in a pass-through entity, such as an unincorporated business, a subchapter S corporation, or a partnership to the tax attributable to income derived by the individual from that entity.

current year basis the costs of R&E expenditures incurred in connection with a present or future trade or business.

The Code does not specifically define R&E for section 174 purposes, except to exclude such costs as expenditures for the acquisition or improvement of depreciable or depletable property or land. For section 174 purposes, R&E is defined in Treasury regulations as "research and development costs in the experimental or laboratory sense." Proposed regulations issued in 1989 defining section 174 expenses clarified that basic and applied research costs, as well as certain product development costs, are included as "research or experimental expenditures."

The Technical and Miscellaneous Revenue Act of 1988 (Public Law 100-647, 102 Stat. 3342 [1988]), which extended the credit for 1 year, also included a provision that linked, for the first time, the deduction of research expenditures to the credit. Beginning in 1989, the act requires that one-half the amount of the credit taken be subtracted from the deduction claimed under section 174.[1]

Large Manufacturing Corporations Have Been the Primary Users of the Credit

Our analysis of IRS data shows that large corporations—those with assets greater than, or equal to, $250 million[2]—used about 80 percent of the total credit claimed for tax years 1981 through 1985, the latest years for which data were available. These same corporations accounted for almost 75 percent of the total assets of corporations filing tax returns for those tax years and claimed about 85 percent of all other tax credits, such as the investment tax credit.

[1] If the taxpayer elects to capitalize section 174 expenses, one-half of the credit amount must be subtracted from the amount capitalized.

[2] An average of 1,068 corporations per year met this definition for the 5-year period.

Table 1.2: Who Claimed the R&E Tax Credit

Year	Individuals[a]	Corporations with assets < $250 million	Corporations with assets ≥ or $250 million	Total
1981	$2.7	$127.6	$511.7	**$642.0**
1982	15.1	202.2	637.0	**854.3**
1983	17.8	248.3	1,029.1	**1,295.2**
1984	23.2	349.0	1,240.1	**1,612.3**
1985[b]		303.6	1,324.4	**1,628.0[b]**
(percentages of total credit claimed each year)				
1981	0.4%	19.9%	79.7%	**100.0%**
1982	1.8	23.7	74.6	**100.1[c]**
1983	1.4	19.2	79.5	**100.1[c]**
1984	1.4	21.6	76.9	**99.9[c]**
1985[d]		18.7	81.4	**100.1[c,d]**

[a]Includes the credit claimed by sole proprietors and partners.

[b]IRS reports did not present the amount of credit claimed by individuals, sole proprietors, and partners for 1985. Thus, the total includes only the credits claimed by corporations.

[c]Total does not add to 100 due to rounding.

[d]These 1985 figures represent percentages of total credits claimed by corporations.

Source: GAO analysis of Statistics of Income Division's annual samples of individual and corporate income tax returns.

Our analysis of income tax return data for a sample of 800 of these large corporations showed that corporations in the manufacturing industry, especially those manufacturing office machinery, chemicals, electrical equipment, and motor vehicles, made the most use of the credit. The industrial categories that IRS used, however, are not necessarily consistent with how the taxpayer categorizes itself; corporations are often involved in many endeavors.

Objectives, Scope, and Methodology

In December 1987, Congressman Brian Donnelly asked us to (1) determine how IRS ensures that taxpayers claiming the credit comply with the Internal Revenue Code and (2) assess the effectiveness of the R&E tax credit in stimulating investment. In November 1988, the Technical and Miscellaneous Revenue Act of 1988 mandated that we study the credit. The mandated study incorporated the two objectives of our ongoing work and added a third one—to study the structure of the credit, including alternatives to its current structure.

Compliance With the Internal Revenue Code

To address the objective concerning compliance with the Code, we primarily studied audits of the 1,433 largest corporations. IRS Examinations does not have a system to identify the firms that had claimed the credit, nor could it identify firms that had been audited for the R&E credit. Given the time frames of this study, we were unable to wait for data from other IRS files to identify firms that claimed the credit. Rather, we relied on a questionnaire completed by revenue agents who coordinated the most recent IRS audit of a stratified sample of the 1,433 largest corporations. The questionnaire was designed to obtain information both on corporations claiming the credit and on the results of IRS audits of the credit. Appendix II explains the questionnaire's scope and response rates; a copy of the questionnaire appears in appendix III.

Our sample covered 192 corporations in 5 industries that are heavy users of the credit—aerospace, data processing, pharmaceuticals, electronic components, and utilities—and a random sample of 169 of the remaining corporations. From the total sample of 361, we received 324 responses (a 90-percent response rate)—179 covered audits of the targeted industries and 145 covered audits of the random sample. The results of our sample are projectable to the nationwide universe of large corporation audits. Consequently, the figures used in this report relate to the universe of large corporate audits unless otherwise noted.

We asked respondents to send us copies of documents that explained the audit findings and adjustments, such as the final audit report and the tax form for reporting the corporation's calculation of the credit. We received documents for 137 taxpayers, almost all of whom had claimed the credit. We verified the questionnaire responses to the documents received and made changes where appropriate. We also called some IRS officials to clarify their responses.

We supplemented these data by interviewing some of the respondents in IRS' Boston, Akron, Los Angeles, Newark, and San Francisco offices. We selected the five offices because they had industry specialist coordinators for the five targeted industries. We pretested our questionnaire with Baltimore District Office revenue agents and engineers.

We interviewed IRS officials in Boston, Los Angeles, Newark, and San Francisco and at the IRS national office in Washington, D.C., about what effect, if any, the changes in the Tax Reform Act of 1986 would have on auditing the credit. Almost all of the data used to address IRS' administration of the credit dealt with the credit before the 1986 act changes

occurred. This was because only one of the corporate audits in our sample covered tax year 1986 and most of the revenue agents we interviewed had no experience in auditing the credit as defined by the Tax Reform Act.

Some of the corporations did not agree with all of IRS' proposed adjustment to the credit and therefore appealed their case to the IRS Appeals Division. We obtained data on appeals entered in Appeals' automated Issue Tracking system, including those that had been closed.

Effectiveness of the Credit

To address the objective relating to the effectiveness of the credit, we constructed a data base from extracts of IRS' tax return data on large corporations—i.e., those with assets of $250 million or more. We used these data to estimate the average effective rate of the credit and then combined our results with estimates of corporate behavior, taken from the economic literature, to figure the amount of research spending stimulated by the credit. We made no attempt to (1) estimate the benefits to society resulting from this additional research, (2) evaluate the quality of the research for which the credit was claimed, or (3) assess the effectiveness of the credit in stimulating research vis-à-vis other ways or programs that stimulate research.

IRS' Statistics of Income Division (SOI) collects annual samples of corporate income tax returns in which it attempts to include all corporations with assets exceeding $50 million. We obtained selected data from the 1981 through 1985 samples, the latest available, for all large corporations. From these samples, we selected the 800 corporations that (1) were included in the 1981 through 1985 samples, (2) had assets of more than $250 million in at least 1 sample year, and (3) reported earning the R&E tax credit or reported making qualified research and experimentation expenditures in at least 1 of the 5 years. These corporations accounted for 69 percent of the total research expenditures reported by corporations between 1981 and 1985.

We supplemented this information with selected corporate tax return data for the same corporations from the IRS Business Master File (BMF) and Returns Transaction File (RTF). In some cases, these additional data enabled us to extend our analysis back to 1978 and forward to 1987 to account for carrybacks and carryforwards of credits. We did not assess these data for reliability, but we checked inconsistencies in the SOI data against tax returns and made corrections where appropriate. We worked

exclusively with the pre-Tax Reform Act credit because more recent data were not available from IRS.

We analyzed the corporate income tax return data to determine (1) how much credit each corporation earned for spending an additional dollar in each year, (2) when the corporations were able to use the credits they earned, and (3) what share each corporation had of the sample's total spending. On the basis of this information, we estimated the effective rate of credit. By combining our results with estimates of the responsiveness of corporate research spending to price incentives such as the credit, we estimated the amount of credit-stimulated additional spending. Appendix IV gives a detailed explanation of our methodology.

We also interviewed several officials at the National Science Foundation (NSF) in Washington, D.C., and reviewed their studies on credit effectiveness. In addition, we analyzed economic studies on the credit, as well as studies on the credit's price elasticities.

Alternatives to the Credit's Current Structure

To address the objective on the credit's structure, we analyzed changes to the credit proposed by Congress and the administration, such as indexing the base to the growth in the gross national product (GNP). Relying both on the data we developed to address the credit's effectiveness and on hypothetical case studies, we attempted to determine the effect these changes would have on the amount of corporate investment in research and experimentation.

We discussed the information contained in this report with responsible officials at IRS and Treasury. They suggested some technical clarifications, which were made to the report. We did all of our work between January 1988 and June 1989 and in accordance with generally accepted government auditing standards.

Uncertainty Over the Definition of the R&E Tax Credit Has Led to Many Audit Adjustments

IRS administers the R&E tax credit primarily through corporate audits. On the basis of a survey of IRS revenue agents, we concluded that the current credit is relatively difficult to audit. IRS questioned the credit claimed by 79 percent of the corporations in which the credit was audited. The amount questioned represented 20 percent of the credit claimed. However, some corporations appealed the amounts IRS questioned. Many revenue agents reported that the definition of qualified research expenses was unclear. Treasury recently issued regulations that should help resolve such questions. Consequently, it is premature at this time to suggest legislative changes to make the credit easier to administer.

IRS' Coordinated Examination Program involves audits of the largest and most complex corporations. Corporations are included in the program on the basis of such criteria as gross assets and receipts, number of operating units, and number of industries involved. The corporations that meet these criteria vary from year to year but have numbered about 1,400 since 1984.

These audits take about 30 months, are done by teams of revenue agents that include such specialists as engineers and computer analysts, and usually cover 2 tax years. IRS had about 2,325 revenue agents involved in auditing these large corporations in 1987.

IRS Routinely Audits the Credit Claimed by Large Corporations

We estimate that IRS audited the credit of 74 percent of the large corporations that claimed it.[1] IRS revenue agents reported that they did not audit the credit claimed by the remaining 26 percent of the corporations because the amount claimed was small compared to other items on the tax returns. We estimate that the corporations for which IRS audited the credit claimed $1.8 billion of credit for the period audited.[2]

IRS statistics on the Coordinated Examination Program show that IRS Examinations assessed $5.1 million of additional taxes and penalties for each corporation in the program in 1987. IRS audit adjustments were sizable. IRS adjusted the amount of research credit claimed for 79 percent of the corporations—70 percent had their credit reduced and 9 percent had their credit increased. We estimate that, when adjusting the credit,

[1]Fifty-two percent of the corporations that had a closed audit claimed the credit.

[2]Because we asked revenue agents to provide information on the most recent audit, the years covered by the audits varied but all covered at least 1 year between 1981 and 1986.

IRS on average decreased each large corporation's claimed research credit by about $1 million.

Table 2.1: Adjustments Made to the Credit

Dollars in billions

	Number of firms	Credit claimed	IRS adjustment
Decrease in credit	303	$1.551	($.368)
No change to credit	88	.249	0
Increase in credit	38	.027	.007
Total	**429**	**$1.827**	**($.361)**

We analyzed the responses for the five selected industries in our sample—aerospace, data processing, pharmaceuticals, electronic components, and utilities. A major issue in the aerospace industry was credit claimed for independent research and development (R&D) done in connection with certain types of Department of Defense contracts. Research funded by any person, including a governmental entity, is not eligible for the credit according to the Code. However, the legislative history of the 1981 act is unclear as to whether independent R&D expenditures made in connection with a government contract are funded research for the purpose of claiming the credit.[3] The final regulations issued in May 1989, provided that payments under such contracts are not to be treated as funded except where they are severable from the underlying contract.

A major audit issue in the utility industry was adjustments to credits claimed for money paid to industry research institutes that were disallowed by revenue agents auditing these institutes. Some of the research done by the institutes did not meet the tests for qualified expenditures. Because utility corporations typically contribute to these institutes, much of the industry was affected.

[3]In response to comments received on the proposed regulations, IRS' Office of Chief Counsel changed its position on whether independent R&D expenses were considered funded research and therefore Appeals reversed the revenue agents adjustments.

Unclear Definition of the Credit Led to Audit Adjustments

IRS revenue agents most frequently cited four reasons for adjusting research expenditures claimed by corporations. Most agents who audited these issues also said that these four issues were difficult to resolve.

Table 2.2: Most Common Reasons for Adjusting the Credit

Type of expenditures	Agents who cited reason for adjustment[a]	Agents who found the issue was difficult to audit[b]
Adapting existing capability	46%	63%
Routine or cosmetic alteration	41	69
Overhead and administrative expenses	41	58
Ordinary testing	25	75

[a]The percent of all agents who said they adjusted the credit.

[b]The percent of those agents who said that they audited this issue and found it difficult to audit.

We estimate that 54 percent of all revenue agents found at least one issue or aspect of the credit difficult to audit. This credit, according to an Examinations official, is more difficult to audit than other credits, such as the investment tax credit. About one-fifth of the revenue agents found the definition of qualified expenditures unclear. One reason some of the agents cited was the lack of final regulations. Final regulations have the full force of law, but proposed regulations do not. Treasury issued proposed regulations redefining R&E in January 1983, and reproposed the definition in May 1989. For purposes of the credit, the window of uncertainty has been confined to the period beginning with the enactment of the credit in 1981 and ending with the enactment of the Tax Reform Act of 1986, which contained a detailed definition of R&E.

Corporations Typically Appealed at Least Some of the Additional Taxes IRS Proposed

Once IRS Examinations staff complete an audit, the corporation may still disagree with the additional taxes IRS has proposed. If the taxpayer and Examinations cannot agree on the proposed additional taxes, the taxpayer may administratively appeal the decision to the IRS Chief Counsel's Administrative Appeals Division; or if a Statutory Notice of Deficiency is issued by Examinations, the taxpayer may petition for a hearing in Tax Court, U.S. District Court, or the Claims Court. In general, IRS statistics show that administrative appeals of large cases take another 2 years to settle. However, large cases are defined differently by Appeals and Examinations. Appeals defines a large case as one in which the taxpayer disagrees with at least $1 million in Examinations' proposed adjustments. Appeals' records show that these taxpayers

(usually corporations) appeal more than one issue (e.g., research credit, investment tax credit, and employee benefit deductions).

Fifty-one corporations administratively appealed about $137 million of the adjustment IRS Examinations proposed.[4] IRS Appeals records showed that about half of the administrative appeals had not been settled and that about one-fourth were not tracked in the Appeals automated data base. For those appeals that had been settled, the settlement varied by corporation. Sometimes, the disputed amount of the credit was decided entirely in favor of either the corporation or Examinations. Most cases, however, were settled partially in favor of IRS and partially in favor of the corporation.

Conclusion

Ambiguities exist in identifying research expenditures that qualify for the credit. IRS has reduced the credits claimed in about three-fourths of corporations audited, and some of these corporations appealed IRS' decision.

Revenue agents said that the definition of R&E was unclear and that the credit was difficult to audit. A contributing factor was the absence of final regulations. The proposed regulations Treasury issued in May 1989 should help corporations and revenue agents determine if expenditures qualify for the credit. Because the results of these changes cannot yet be determined, it would be premature at this time to suggest legislative changes to make the credit easier to administer.

[4]We use actual numbers and dollar amounts, instead of projected estimates, throughout this report when referring to Appeals cases.

The Tax Credit Has Had Some Effect in Increasing R&E Spending

The R&E tax credit has raised corporate spending on R&E above the level that otherwise would have been achieved. On the basis of our sample of 800 corporations and accepted economic models, we estimate that the credit stimulated between $1 billion and $2.5 billion of additional spending for the 5 years 1981 through 1985. This represents an increase of between 15 and 36 cents for every dollar of tax revenue foregone due to the credit over this period. Our analysis indicates that the spending increase was limited because, although the statutory rate of the credit was 20 percent, the credit actually provided an average effective incentive of only 3 to 5 cents for each additional dollar spent on research and experimentation in the early 1980s. Changes in the tax code since 1986 have further reduced the incentive provided by the credit.

R&E expenditures may generate benefits to society beyond those realized by companies that make these expenditures. If the activities encouraged by the credit are more beneficial to society than the activities discouraged by the additional taxes needed to fund the credit, then the credit is acceptable tax policy.

Increased Spending Depends on the Credit's Marginal Incentive and the Extent of the Corporate Response

The credit's stimulative effect depends on the marginal incentive provided by the credit, commonly known as the effective rate of credit, and the extent to which corporations respond to price incentives. The marginal incentive is the benefit a company receives for spending an additional dollar on research; it is equivalent to a reduction in the price of a unit of R&E. This marginal incentive is company-specific and depends on each company's spending behavior and tax status; we found that, on average, the marginal incentive for R&E spending was low. Furthermore, the best available evidence indicates that corporate spending on R&E is not very responsive to price reductions.

The primary factor determining an individual company's effective rate is that company's pattern of qualified spending over a period of years. An increase in a company's current spending will raise the 3-year moving-average base for future years and thereby reduce future credits. The effective rate of credit is lower than the statutory rate (20 percent) because it takes these future reductions into account.

Another important factor in determining a company's effective rate of credit is its tax status. A company that has no tax liability in a given year receives no current benefit from any credit it earns that year,

unless it can carry the credit back to offset prior-year taxes. If the company must wait until some future year before it can use the credit, the present value of the tax benefit will be less than its face value.

An estimate of the effective rate of credit represents half of the information needed to estimate the credit's impact on spending. The other half of the calculation is how corporate spending responds to reductions in the price of R&E. The economic literature includes a number of studies that estimate the responsiveness of R&E spending to changes in price, also known as the "price elasticity" of spending.

These studies, the best available evidence, indicate that spending on R&E is not very responsive to price reductions. Most of the elasticity estimates fall in the range of -0.2 to -0.5, implying that a 1-percent reduction in the price of R&E would eventually lead to between a 0.2-percent and a 0.5-percent increase in spending.[1] Since it is commonly recognized that all of the estimates are subject to error, we used a range of elasticity estimates to compute a range of estimates of the credit's impact.[2]

We estimated effective rates of credit for each of the 800 companies in the sample and then computed a weighted average across companies for each of the years 1981, 1982, and 1983. We combined our estimates of the average effective rates with a range of price elasticities to estimate the percentage by which the sample's spending was increased each year due to the credit. Then we used our range of percentage increase estimates, expenditure data for the sample, and aggregate expenditure data published by IRS, to arrive at our estimate of additional spending stimulated by the credit from 1981 through 1985—$1 billion to $2.5 billion.[3]

[1]Although a few economists, such as Baily and Lawrence (1985), argue that the elasticity could be as high (in absolute value) as -1, most economists familiar with the literature believe the elasticity is smaller (in absolute value) than -0.5.

[2]See appendix IV, pp. 72-73, for further discussion of elasticity estimates.

[3]Data needed to produce precise estimates of the 1984 and 1985 effective rates were not available at the time of our study. Therefore, we assumed that the rates in 1984 and 1985 were the same as the average of the rates for 1982 and 1983. The data on expenditures after 1983 gave us no reason to believe that the rates for 1984 and 1985 would be substantially different. A detailed description of our estimation procedures is presented in appendix IV.

A Low Marginal Incentive and a Low Corporate Response Limited the Increase in Research Spending

We estimate that for the 5 years 1981 through 1985 the credit stimulated between $1 billion and $2.5 billion out of the estimated total of $154.7 billion that corporations spent on qualified research for the period. We also estimate that from 1981 through 1985 the credit cost Treasury about $7 billion in revenues foregone. In other words, the credit stimulated between 15 and 36 cents of additional spending for each dollar of revenue given up by the credit. We concluded that the increases attributable to the credit were limited due to the low average effective rate of credit in the early 1980s and because research spending has been estimated to be relatively unresponsive to price reductions. See appendix IV for a detailed explanation of how we estimated additional research spending and the total revenue cost of the credit.

The Average Effective Rate of Credit in the Early 1980s Was Well Below the Statutory Rate

We estimate that the average effective rate of credit was approximately 3 percent in 1981, 5.2 percent in 1982, and 4.3 percent in 1983—compared to the statutory rate of 25 percent.[1] The 1981 rate was particularly low due to transitional rules that were in effect when the credit was first implemented. In each year, the effective rate of credit varied considerably across firms. In 1982, for example, some corporations faced effective rates as high as 25 percent, while others faced negative rates as low as -20 percent. Most corporate research spending, however, was undertaken by corporations that received an effective rate between 0 and 10 percent.

The pattern of a company's spending over time is a principal determinant of its effective rate. To see which growth patterns were predominant, we grouped the sample corporations into four categories according to their spending behavior from 1981 through 1985. Table 3.1 shows the percentage of the sample in each category and shares of total expenditures and total credits earned from 1981 through 1985 attributable to each category.

[1]Unless otherwise noted, the effective rates of credit presented in this report are based on an assumed discount rate of 12 percent. Since the effective rate estimates are sensitive to the discount rate assumption, we present estimates based on alternate assumptions in appendix IV.

Table 3.1: Use of the Credit by Corporations Grouped by Expenditure Growth Patterns[a]

	Full sample[b]	Continuous growth	Growth at first, then discontinued	Delayed growth	Erratic spending patterns
Percent of corporations	100.0%	32.9%	33.1%	8.8%	24.6%
Percent of qualified expenditures, 1981-1985	100.0	75.0	10.9	1.7	12.2
Percent of credits earned, 1981-1985	100.0	85.9	6.1	1.6	6.4

[a]See the following section for definitions of each growth pattern.

[b]The full sample includes a few corporations that filed credit forms even though their spending never exceeded their base amounts. These corporations accounted for less than 0.1 percent of total sample spending.

Source: GAO analysis of a subset of 800 corporations from SOI's annual sample of corporate income tax returns.

Table 3.2 shows the weighted average effective rates of credit for each spending growth category.

Table 3.2: Average Effective Rates of Credit by Corporations Grouped by Expenditure Growth Patterns[a]

	Full sample[b]	Continuous growth	Growth at first, then discontinued	Delayed growth	Erratic spending patterns
1981	3.0%	1.4%	9.6%	−11.0%	6.7%
1982	5.2	5.3	11.1	−6.5	0.5
1983	4.3	5.5	7.1	−3.1	−5.1

[a]See the following sections for definitions of each growth pattern.

[b]The full sample includes a few corporations that filed credit forms even though their spending never exceeded their base amounts. These corporations accounted for less than 0.1 percent of total sample spending.

Source: GAO analysis of a subset of 800 corporations from SOI's annual sample of corporate income tax returns.

The four categories are:

Continuous Growth. This category includes corporations in which expenditures exceeded their base amount in every year from 1981 through 1985. Table 3.1 shows that almost one-third of the sample corporations are included in this category and they accounted for 75 percent of total qualified spending. These same corporations earned almost 86 percent of all credits earned during the period. Table 3.2 shows their average effective rates of credit were 5.3 and 5.5 percent in 1982 and 1983, respectively. The design of the credit—specifically, the moving-

average base—produced a relatively small incentive for corporations that increased their spending each year.

Growth at First, Then Discontinued. Corporations in this category were able to earn a credit in 1981 but stopped earning credits at some point between 1982 and 1985 and did not thereafter earn a credit during the sample period. Another third of the sample corporations were in this category; they accounted for 10.9 percent of total qualified expenditures and 6.1 percent of total credits earned during the period. Corporations in this category had relatively high effective rates of credit in the last year that they earned the credit. This is because their spending in the last year did not lead to reductions in their credits in later years, since they had no credits to be reduced. The average effective rate in 1981 for corporations that stopped earning credits in 1982 was 23 percent. Corporations in this category in which growth stopped in 1983 or 1984 had lower 1981 effective rates, which brought the category's overall average effective rate down to 9.6 percent.

Delayed Growth. Corporations in this category—about 9 percent of the sample—did not earn a credit in 1981 but in a later year. Furthermore, once they started, they earned a credit in each remaining year of the sample period. These corporations faced a substantial negative effective rate of credit in the year before they first earned a credit. This was because they earned no credit in the current year, but by spending additional amounts they would reduce the credit they could earn in future years. The average effective rate in 1981 for corporations that began earning credits in 1982 was -22 percent.

Erratic Spending Patterns. This category includes corporations that followed erratic spending patterns—interspersing years of positive growth over their base amount with years of negative growth. The corporations in this category had an incentive to shift expenditures out of the years in which they would earn no credit and into the years when their additional spending would earn them credits. We are unable to tell how much spending was actually shifted as a result of this incentive. However, we found little evidence of "cycling" behavior, that is, the repeated clustering of expenditures every 2 to 4 years with below-base spending in the intervening years.

In short, if a corporation earned a credit every year, its effective rate was relatively low. If a corporation earned a credit and then stopped, its effective rate was high in the last year that it earned the credit. If a

corporation did not earn a credit in a given year, its effective rate would be zero or negative.

We examined two other factors—the 50-percent limit[5] and the inability of corporations to use the credits they earn—that might contribute to lowering the credit's effective rate. We found both factors to be relatively unimportant. In table 3.3, we compare the average rates for each year with the average effective rates that would have prevailed if each of the constraining factors had been eliminated. This comparison shows that eliminating the 50-percent limit would have raised the average effective rate by a minimal amount in 1981; it would have had no effect in 1982 or 1983 because in those years it affected very few corporations.

Table 3.3: Effective Rates of Credit Under Various Assumptions[a]

	1981[b]	1982	1983
Effective rate of credit computed by GAO	6.2%	5.2%	4.3%
Effective rate if the 50 percent base limit was not in effect	6.5	5.2	4.3
Effective rate if companies received refunds for credit amounts they could not use immediately	6.4	5.9	4.6

[a]Assumed discount rate = 12

[b]For 1982 and 1983, the rates are the actual rates that prevailed. to facilitate year to year comparisons the 1981 rate was computed as if the special transition rules that reduced the effective rate in that year did not exist

If corporations had been given refunds for all credits that they were unable to use for current or past tax liabilities (through carrybacks), the average effective rate would have risen from 5.2 percent to 5.9 percent in 1982. In 1981 and 1983, the removal of this constraint would have had even less effect. The tax liability constraint had only a minor impact because most companies could use all of the credits they earned immediately. Furthermore, many corporations that were in a nontaxable status in a given year remained in that status for the next few years. Therefore, while the benefit a company received for increasing its current spending in the given year was delayed (and thus discounted), the negative effects resulting from increases in later base spending amounts were also delayed.[6]

[5]The 50-percent limit applies to companies in which current-year expenditures exceed twice their 3-year average spending. For these companies, the base amount is 50 percent of these current year expenditures.

[6]Companies that started up after 1981 are not included in our sample. These companies are more likely than large companies to be constrained by the 50-percent limit and the lack of tax liabilities.

Changes in the Tax Code Have Reduced the Credit's Effective Rate

The credit's effective rate since the time period of our estimates has been reduced because of changes in the Code. These changes, brought about by the Tax Reform Act of 1986 and the Technical and Miscellaneous Revenue Act of 1988, reduce the amount of credit corporations can earn and affect corporations' ability to use those credits they have already earned. On the other hand, these changes reduce the revenue cost of the credit below what it would have been without the changes. The changes included:

- reducing the rate of the credit,
- more narrowly defining qualified research,
- lowering the corporate tax rate,
- including the credit in the general business credit,
- disallowing the credit to offset the alternative minimum tax, and
- linking the deduction for research expenditures to the credit.

The Tax Reform Act of 1986 has reduced the amount of credit that corporations can earn by lowering the statutory rate of the credit from 25 percent to 20 percent and by establishing a stricter definition of qualified R&E expenditures. The 20-percent reduction in the statutory rate of credit may have reduced the effective rate of credit by almost 20 percent. When we recomputed the effective rates for 1983, using a statutory rate of 20 percent rather than the actual 25-percent rate, the average effective rate fell by approximately 20 percent, dropping from 4.3 percent to 3.5 percent.

The redefinition of qualified expenditures might have reduced the extent by which qualified spending in 1987 and 1988 exceeded base spending for those years. This is because, with the exception of certain rental expenses, corporations were not permitted to recompute their base expenditures to agree with the stricter definition. The redefinition, therefore, also will have reduced the average effective rate of credit. The size of this reduction is unknown because data on post-1985 spending were not available at the time of our review.

Other changes brought about by the 1986 act affect the ability of corporations to use the credits they have earned. The act lowered the maximum rate of the corporate income tax from 46 to 34 percent, but it also broadened the base of the tax. The combination of these two changes has increased average corporate tax liabilities; but individual industries and corporations may have seen their liabilities either raised or lowered. It is unknown at this time whether these two changes have raised or lowered the number of corporations that are unable to use their credits

immediately. Two other changes enacted in 1986—the incorporation of the R&E credit into the general business credit and the new alternative minimum tax calculation—have restricted corporations' ability to use their credits.[7] We cannot measure the effect that these new restrictions have had on effective rates.

The Technical and Miscellaneous Revenue Act of 1988 indirectly reduced the effective rate of the R&E credit by adding a provision to the Code that lowers each company's section 174 deduction for qualified research expenses. The deduction or amount capitalized is reduced by an amount equal to 50 percent of the R&E credit that the company claims for the year. For corporations with tax liabilities, this provision reduces the effective rate of credit by roughly 17 percent (half of the 34-percent maximum corporate tax rate).

The R&E Spending Stimulated Does Not Fully Measure the Credit's Effect

We were asked to determine if the credit had stimulated any additional R&E spending. We estimate that the credit did meet this minimum criterion of effectiveness. However, the amount of spending stimulated does not reveal the full effect of the credit.

The R&E credit is basically a transfer of money from all taxpayers to those taxpayers that exceed their base research spending. This transfer induces changes in the productive activities within the economy. It is commonly held that the average social rate of return on research and development spending is greater than the average social rate of return on nonresearch spending.[8] However, the existing data concerning social rates of return to both research and nonresearch spending are not comprehensive.

If the activities that are encouraged by the credit are, in fact, more beneficial to society than the activities that are discouraged by the additional taxes needed to fund the credit, then the credit is acceptable tax policy. However, the fact that the credit may be acceptable tax policy does not necessarily imply that it is better than alternative forms of government incentives to research. We have not evaluated tax incentives other than the credit, nor have we examined nontax incentives to R&E spending.

[7]Companies may use the general business credit to offset 100 percent of the first $25,000 of their tax liability but only 75 percent of their liability over $25,000. The R&E credit is not allowed against the alternative minimum tax, so the credit cannot reduce a company's regular tax liability below the amount that it would pay under the alternative minimum tax. Leftover credits may be carried back 3 years and forward 15 years.

[8]See, for example, Gravelle (1985) pp. 5-8 and Baily and Lawrence (1985) pp. 8-10.

such as research grants. The more research spending the credit stimulates per dollar of revenue cost, the better the credit compares to other policies. The credit's stimulative effect can be improved by increasing its effective rate. In the next chapter we discuss proposed changes intended to increase the effective rate of the credit.

Conclusion

The average effective rate of the R&E credit for corporations was about 4 percent in the period 1981 to 1983, well below the statutory rate of 25 percent. This was primarily because companies' decisions to spend additional current dollars on research reduced the amount of credit they earned in future years. Most corporate research spending was undertaken by companies that received an effective rate of between 0 and 10 percent.

The credit stimulated between $1 billion and $2.5 billion in additional research at a cost of $7 billion in revenues foregone. The dollar value of this additional research does not take into account the additional benefits to society produced by this research. If, as many economists believe, research activities are more beneficial than nonresearch activities, then the R&E credit is acceptable tax policy.

Evaluation of Proposals to Restructure the Credit

The effectiveness of the R&E tax credit can be improved. Congressional and administration proposals would change the definition of base spending and provide for an alternative credit computation for taxpayers whose expenditures fall below their base spending. Treasury has estimated that these changes would increase the amount of spending stimulated per dollar of revenue foregone from $0.20 to as much as $1.21.

Certain features of these proposals, such as indexing the base to the growth in GNP, could increase the credit's revenue cost and reduce the credit's average incentive over time. Because of this, periodic review and adjustment of the credit, as required in the proposals, will be very important. We also studied an additional change to the proposals that could save over $80 million per year in lost revenues without reducing the incentive for most taxpayers.

Revisions Proposed Would Increase the Credit's Effectiveness

Bills proposed in both Houses of Congress and by the administration call for essentially similar revisions of the R&E credit's structure. Senator Danforth (on behalf of 19 other Senators) and Representative Jenkins (on behalf of 22 other Representatives) have introduced identical bills to revise and make permanent the R&E credit. President Bush's fiscal year 1990 budget proposed revisions to the credit are largely the same as the congressional proposal, except for reductions in the section 174 R&E deduction. In 1988, Treasury estimated that the administration proposal would be roughly revenue-neutral relative to an extension of the current credit, costing $4.9 billion over the 1989-1993 period. Treasury also estimated that the congressional proposal would cost $6.5 billion over the same 5-year period.

The most important feature of these proposals would eliminate the link between current expenditures and future base expenditures, raising the effective rate of the credit. All the proposals would index the base to the growth in GNP. Because of these changes, the 50-percent limit will play a critical role in containing the credit's revenue cost. Periodic review and adjustment of the credit, as proposed in the bills, will also be important. The proposals would also give taxpayers an alternative method for calculating the credit and would extend the credit to start-up companies. The essential characteristics of the current and proposed credits are compared in the following section.

A Comparison of the Current R&E Credit With Alternatives

Base Period Expenditures

Current Law:

Average of qualified expenses in the 3 preceding years. 50 percent limit: Base is equal to the greater of (1) the 3-year average expenditures or (2) 50 percent of current-year qualified expenses.

Congressional Proposal: Two ways to calculate the base are allowed.

Regular Base: For first taxable year beginning after 1989: 1.02 times average qualified expenses between January 1, 1984, and December 31, 1988, multiplied by the sum of 1 plus the average annual rate of growth in nominal GNP for 1987 through 1989. For later years: the prior year's base amount multiplied by the sum of 1 plus the average GNP growth rate for the 3 preceding calendar years.

Optional Base: 75 percent of the regular base. Taxpayers who elect to use the optional base in a given year must also use the optional base in the 2 succeeding years (unless the Secretary allows otherwise). In each of those years, the rate of credit would be 7 percent.

The 50-percent limit would remain unchanged.

Administration Proposal: The administration's proposal is consistent with the congressional proposal's base computations.

Statutory Rate of Credit

Current law: 20 percent.

Congressional Proposals: 20 percent if regular base is chosen, 7 percent if the optional base is chosen.

Administration Proposal: Same as congressional proposal.

Trade or Business Limitations

Current Law: No credit is available to a start-up company for research, the results of which are intended to be used in its future business activities; or to an existing business for research expenses relating to the development of a new line of business.

Congressional Proposal: Credit is allowed for in-house research expenses if, at the time such expenses are paid or incurred, the principal purpose of the taxpayer is to use research results in the active conduct of future trade or business. This includes research done by start-up companies. In each of their first 3 taxable years, base spending for start-up companies equals 50 percent of their current spending. The bases for the fourth, fifth, and sixth years are calculated using special transition rules. In the seventh year, start-up companies will be treated in the same manner as existing companies.

Administration Proposal: Same as congressional proposal.

Section 174 Deduction

Current Law: No deduction is allowed for qualified R&E research expenses equal to 50 percent of the amount of credit claimed that year. A similar rule applies where the taxpayer capitalizes rather than expenses qualified research.

Congressional Proposal: Taxpayers would have the option of (1) reducing their section 174 deduction by 50 percent of the credit or (2) reducing their credit by an amount equal to 50 percent of the credit, multiplied by the maximum statutory corporate tax rate.

Administration Proposal: Taxpayers would have to reduce their section 174 deduction by the full amount of the credit claimed that year.

Redefining Base Spending

To have the greatest stimulative effect on research spending per dollar of tax revenue foregone, the credit should be designed to give a significant tax benefit for any research spending that a firm undertakes above and beyond the amount it would have spent in the absence of a credit. Similarly, no reward should be given for any spending that the firm would have done anyway.[1] Unfortunately, it is impossible to determine

[1]Algebraically, the credit would be calculated as C = r(QS - QSWC) where C = the amount of the credit, r = the statutory rate of the credit, QS = current qualified spending, and QSWC = qualified spending without the credit.

accurately the amount of qualified spending that firms would have undertaken without the credit.

Under current law, qualified R&E spending without the credit (QSWC) is approximated by the average of the firm's annual research spending over the previous 3 years. There are two problems with using this statutory base as a substitute for QSWC. First, discrepancies between the two measures result in firms being rewarded either too much or not enough. In cases where firms would have spent more than the base even without the credit (QSWC exceeds the statutory base), tax revenue is foregone without affecting spending; where QSWC is less than the base, firms are given no incentive to increase their spending, unless they increase it enough to exceed their base. Second, since the measure of base expenditures is defined as a moving average of past expenditures, a firm that decides to increase its spending in the current year will also increase the value of its base expenditures in future years, thereby reducing the credit it can earn in the future.

As shown in chapter 3, this link between current expenditures and future base expenditures has substantially reduced the effective incentive provided by the credit. Modifications that would either break the link between current expenditures and future base expenditures or reduce discrepancies between the chosen measure of base expenditures and what qualified spending would have been without the credit have the greatest potential for improving the credit's stimulative effect.

The bills would retain the incremental nature of the credit but revise the computation of base-period expenditures. A firm would have two options. To use the regular base, in the first year, a firm could use "historical base period research expenses"—102 percent of average qualified spending between January 1984 and December 1988, adjusted for GNP growth for 1987 through 1989.[2] In succeeding years, the company would use this historical base indexed to reflect average GNP growth rate for the 3 preceding calendar years.

Under the second option, a firm could compute its credit as 7 percent (rather than 20 percent) of the difference between its current spending and 75 percent of its regular base. Once elected, this option would have to be used in 2 succeeding years. Under either option, if the company's

[2]Algebraically, the credit would be calculated as HBASE = 1.02(AQS)(1 + g) and C = r(QS - HBASE) where HBASE = historical base expenditures, AQS = average qualified spending, and g = average annual GNP growth.

current spending is more than double its base spending, its base amount automatically becomes 50 percent of current spending.

Table 4.1 compares the current credit with the proposed credit. In this one example, the taxpayer benefits more from the proposed credit in 1990 than the current credit ($105 vs. $61). In 1995, both the proposed regular and optional credits are more advantageous to the taxpayer than the current credit. The advantages for any particular taxpayer will vary depending on the relationship between the rate of the firm's spending growth and the rate of growth in GNP. The spending and GNP growth rate assumptions in this example reflect recent history. The numbers in this hypothetical example would not represent the average company to the extent that actual future growth differs from historical growth.

Table 4.1: Sample R&E Tax Credit Computation for 1990 and 1995—Current Versus Proposed Credit[a]

	Current credit	Proposed credit	
		Regular	Optional
Base expenses for 1990	$1,331	$1,000	
	1,464	1,100	
	1,611	1,210	
	4,406	1,331	
	x 1/3	1,464	
	1,469	6,105	
		x 1/5	
		1,221	$1,245
		x 1.02	x .75
		1,245	934
Credit for 1990	1,772	1,772	1,772
	−1,469	−1,245	- 934
	303	527	838
	x .20	x .20	x .07
	61	105	59
Credit for 1995	2,854	2,854	2,854
	−2,366[b]	−1,722[c]	−1,292[d]
	488	1,132	1,562
	x .20	x .20	x .07
	$98	$226	$109

[a]This example is based on an annual GNP growth rate of 6.7 percent and a steady annual increase of qualified research spending by 10.0 percent, beginning with $1000 in 1984.

[b]1/3($2,144 + $2,359 + $2,594) = $2,366.

[c]($1,245)(1 + .067)[5] = $1,722.

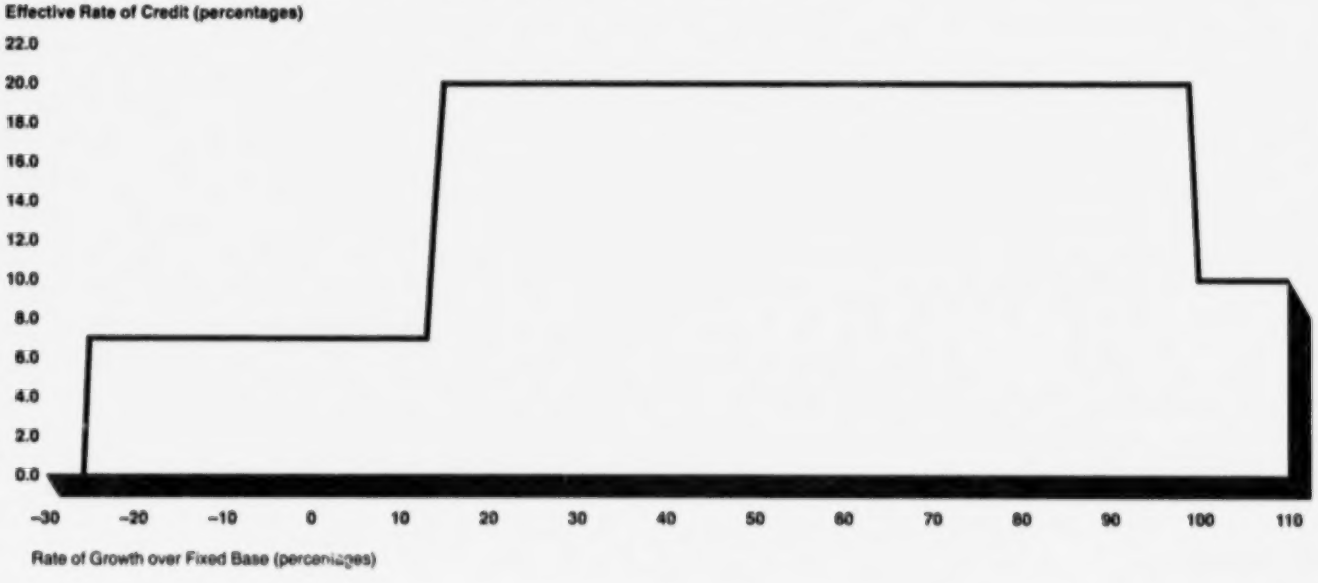
[d]0.75(1,722)

Under the proposal, a company's effective rate of credit would be determined by the growth rate of that company's current expenditures over its base amount:

- companies that spend 75 percent or less of their base amounts would receive no credit;
- companies that select the optional credit would face a marginal rate of 7 percent;[3]
- companies that select the regular credit and whose current expenditures are less than double their base amounts would face a 20-percent rate; and
- companies that exceed twice their base amounts would face a 10-percent marginal rate.

Figure 4.1 shows the relationship between the growth rate of spending over base and the effective rate of credit.

Figure 4.1: Effective Rates of Proposed Credit Across Expenditure Growth Rates



[3]In our discussion of the optional credit computation later in this chapter, we explain why companies with spending growth rates of less than 13.5 percent are likely to choose the optional computation.

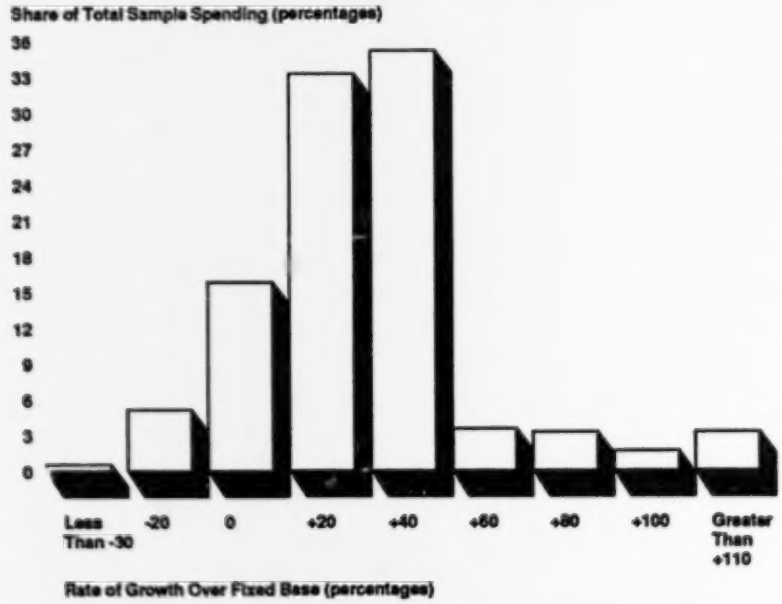
If current spending patterns continue, companies facing an effective rate of 20 percent will do a substantial portion of total research spending. Companies facing marginal rates of 7 percent (those that use the alternative credit calculation) or 10 percent (those that exceed the 50-percent limit) will do most of the remaining spending. It is difficult to predict the weighted average effective rate of the proposed credit precisely, but, since the most common effective rates will be 20 percent, 10 percent, and 7 percent, the average rate will be substantially higher than the current credit's effective rate of less than 4 percent.[4]

The proposed credit's weighted average effective rate and revenue cost in 1990 depend not only on the total amount of qualified expenditures in 1990 but also on the distribution of these expenditures across companies ranked by their spending growth rates. To substitute for the distribution in 1990, we generated a distribution for 1985 by applying the rules for the proposed credit to our sample of 800 corporations.[5] This distribution is presented in figure 4.2.

[4]Unless otherwise noted, the effective rates of credit discussed in this chapter do not take into account any reductions due to the linkage between the amount of credit a company claims and its section 174 business deductions. Taking this linkage into account would result in lower effective rates, as shown on p. 48. The effective rates also do not reflect the inability of some firms to use the credits that they earn.

[5]The distribution that we generated is not a prediction of what the distribution in 1990 or later years will look like. We do not know how rapidly qualified spending has grown since 1986. The distribution in figure 4.2 is simply one of several plausible distributions. We use it as a reference point for discussing other plausible distributions.

Figure 4.2: Distribution of Total Sample Spending Across Spending Growth Rates (1985)



Except for the first and last bars, each bar represents a range of 20 percentage points; the midpoint is shown for each range.

If the distribution of spending in 1990 were roughly similar to the distribution in figure 4.2, the weighted average effective incentive would be about 16 percent,[6] instead of about 4 percent for the current credit. If the distribution were centered further to the left, the average incentive would be lower. If the distribution were centered further to the right, the average effective rate would approach the full statutory 20-percent rate. If, however, the distribution were substantially further to the right, the average effective rate would be between 10 and 15 percent, since a higher proportion of expenditures would be subject to the 50-percent base limit and thus earn credit at a 10-percent effective rate.

The revenue cost of the proposed credit would be sensitive not only to changes in the total amount of research spending, but also to changes in the distribution of spending across companies with different growth rates. To demonstrate the degree of this sensitivity, we used a hypothetical population of 15 companies as a simplified representation of the

[6]See appendix V.

corporate research-spending population in 1990. The distribution of 1990 spending across the firms in this population, and the relationship between 1990 and base spending, is roughly consistent with the distribution presented in figure 4.2.

We examined four possible scenarios for the growth of research spending between 1990 and 1995. In all these scenarios, we assumed that aggregate research spending would grow at least as rapidly as GNP, on the basis of past years' experience. The corporate population is represented by 15 companies, each with base spending of $100. We summarize our analysis in table 4.2.

Table 4.2: Four Scenarios for the Growth of R&E Spending, 1990 - 1995[a]

											% Distribution of Expenditures	
			Scenario 1		Scenario 2		Scenario 3		Scenario 4			
Company	1990 Base	1990 Spending	1995 Base	1995 Spending	1995 Base	1995 Spending	1995 Base	1995 Spending	1995 Base	1995 Spending	In 1990, Scenarios 1 and 3	In Scenarios 2 and 4
1	$100	$40.0	$150	$60.0	$150	$17.8	$150	$70.0	$150	$20.8	2.1%	0.6%
2	100	90.0	150	135.0	150	92.8	150	157.5	150	108.3	4.8	3.3
3	100	105.0	150	157.5	150	115.3	150	183.8	150	134.5	5.6	4.1
4	100	115.0	150	172.5	150	130.3	150	201.3	150	152.0	6.1	4.6
5	100	120.0	150	180.0	150	137.8	150	210.0	150	160.8	6.4	4.9
6	100	120.0	150	180.0	150	137.8	150	210.0	150	160.8	6.4	4.9
7	100	125.0	150	187.5	150	187.5	150	218.8	150	218.8	6.7	6.7
8	100	130.0	150	195.0	150	195.0	150	227.5	150	227.5	6.9	6.9
9	100	135.0	150	202.5	150	202.5	150	236.3	150	236.3	7.2	7.2
10	100	140.0	150	210.0	150	252.2	150	245.0	150	294.2	7.5	9.0
11	100	140.0	150	210.0	150	252.2	150	245.0	150	294.2	7.5	9.0
12	100	140.0	150	210.0	150	252.2	150	245.0	150	294.2	7.5	9.0
13	100	145.0	150	217.5	150	259.7	150	253.8	150	303.0	7.7	9.2
14	100	150.0	150	225.0	150	267.2	150	262.5	150	311.7	8.0	9.5
15	100	180.0	150	270.0	150	312.2	150	315.0	150	364.2	9.6	11.1
Total	**$1,500**	**$1,875.0**	**$2,250**	**$2,812.5**	**$2,250**	**$2,812.5**	**$2,250**	**$3,281.3**	**$2,250**	**$3,281.3**	**100.0%**	**100.0%**
Total credit earned		$91.2		$136.7		$169.9		$222.4		$242.0		

[a]See the following section for the description of each scenario.

For the first scenario, we hypothesized that both GNP and aggregate research spending will grow by 50 percent between 1990 and 1995. We also assumed that the spending growth is the same for all firms, so that the percentage distribution of spending remains constant. In this case,

the rate of growth in the aggregate amount of credit earned (from $91.20 to $136.70) is equal to the 50-percent growth rates in GNP and spending.

The second scenario is the same as the first, except that the distribution of spending is shifted more heavily to the faster growing firms. (See the last two columns in table 4.2.) This moderate shift in the distribution increases the credit's revenue cost to $169.90, about 24 percent greater than in scenario 1.

In scenario 3, we assumed that aggregate research spending will grow 1.5 times as rapidly as GNP and that the distribution of spending will remain constant.[7] Under these assumptions, the amount of credit earned would be $222.40 in 1995. This growth is almost twice as rapid as the assumed growth in spending and almost three times as rapid as the assumed growth in GNP between 1990 and 1995.

In scenario 4, we assumed that the distribution of spending shifts upwards. The credit's revenue cost would grow to $242.00, an additional 8.8 percent over scenario 3.

One potential problem with the proposed credit is that, if research spending continues to grow more rapidly than GNP, the average company's expenditures in 1995 could be substantially higher relative to its base expenditures than they will be in 1990. In this event, the rapid increase in revenue costs, as depicted in scenarios 3 and 4, would occur. In the long run, if this trend were to continue and no adjustments were made to the credit, an increasing number of companies would become subject to the 50-percent base limit. This limitation would moderate the further growth of the credit's revenue cost, but at the price of having a larger proportion of total spending done by companies that face an effective incentive of 10 percent rather than 20 percent. Even so, the 10-percent effective incentive would be higher that the average effective incentive under current law.

The Base of the Proposed Credit Is Likely to Diverge Substantially From the Ideal Base Over Time

The ideal credit would have a base equal to what qualified spending would have been without the credit and an indexing factor for each firm that would grow at the same rate that the firm's spending would have grown in the absence of the credit. Although we have shown that a fixed base will substantially improve the initial effectiveness of the credit, it

[7]According to NSF data, corporate research spending grew 1.5 times as rapidly as the GNP between 1975 and 1985.

carries the potential for becoming quickly outdated as a measure of what a firm would have spent. The base of the proposed credit would be, at best, a rough approximation of the ideal base (QSWC) in 1990, and GNP would be a very rough approximation of the ideal index for most companies. This combination of an inaccurate base and an inaccurate index means that after several years, the base of the proposed credit could bear very little relation to the ideal base.

Since growth rates of expenditures vary substantially across firms, no aggregate indexing factor can approach the ideal factor for every company. The best aggregate index would grow at a rate close to the total qualified research spending growth rate. Table 4.3 compares the percentage increase in estimated aggregate qualified research spending from the end of 1981 through the end of 1985 to the percentage increases in nominal GNP and other potential indexes over this same period. The relationships among these indexes could be substantially different in the period 1990 through 1995.

Table 4.3: A Comparison of the Increase in Qualified Research Spending With the Increases in Various Indexes From the End of 1981 Through the End of 1985

	Percentage Increase
GAO's estimate of qualified research spending	54.0%
Nominal GNP	31.5
NSF's estimate of corporate research spending	46.0
Index of industrial production	11.4
Producers price index	9.0
Consumers price index	18.4
Implicit price deflator for GNP[a]	18.0

[a]The price index used to compute constant-dollar values for GNP.

Source: GAO computations based on table IV.2 and data from the Economic Report of the President, 1989.

The percentage increase in total company-funded R&D spending, as reported by the NSF, came closest to the growth in estimated qualified spending over the period 1981 through 1985. The GNP percentage increase came after that. Increases in the index of industrial production and in the three price indexes shown in the table all fell far short of the increase in qualified spending.

GNP has one advantage as an index for the credit over NSF's measure of R&D spending in that it is published in advance of NSF's figure. However, since an index based on a 3-year average growth rate in the spending

reported by NSF is not likely to fluctuate greatly, a somewhat dated NSF index may be preferable to a more current, but less accurate, GNP index.

One company-specific index that might be used is each company's gross receipts, as reported on their tax returns. We compared the growth in qualified spending with the growth in gross receipts for the 777 corporations in our sample that had 1981 and 1985 gross receipts data. We found that, from the end of 1981 through the end of 1985, the aggregate research spending of these corporations increased by 52.5 percent, while their gross receipts increased by only 12.4 percent.[8] The growth rates varied across corporations, but our comparison of aggregate increases indicates that a large share of qualified spending was done by corporations in which spending increased much more rapidly than gross receipts. Therefore, gross receipts would have been a poor index for the base during the early 1980s.

Whatever index is chosen, the base of the proposed credit for many companies is likely to diverge considerably over time from their ideal bases, that is, what they would have spent without the credit. As long as the effective rate of the credit is positive, taxpayers would never spend less than their ideal bases, but many taxpayers could end up spending less than their statutory bases even if the effective rate is high. On the other hand, taxpayers whose current spending is well above their statutory base probably would have made most of those expenditures even without the credit.[9] In reality, rather than being an accurate measure of what companies would have spent on research without the credit, the base will simply be a rough tool for controlling the revenue cost of the credit. Without a base, companies would get a credit for all spending they did and even more tax revenues would be spent for research that would have been done even without the credit.

The 50-Percent Limit Will Play a Critical Role in Containing the Revenue Cost of the Credit

As explained above, the revenue cost of the proposed credit would rise considerably if the growth rate of expenditures significantly outpaces GNP growth. One factor that would mitigate this rise is the 50-percent

[8]It is not surprising that the percentage increase in gross receipts for a set group of corporations is lower than the percentage increase in GNP, since the latter increase includes growth due to the establishment of new companies in the economy. Our sample does not include corporations that came into existence after 1981.

[9]Even under the best circumstances, it is unlikely that the proposed credit would cause many companies to increase their qualified research spending by more than 15 percent over what they would have spent in the absence of the credit. A company that received the highest possible effective rate (16.6 percent after the Sec. 174 adjustment) and that was much more responsive to price incentives than the average company (i.e., it increased its spending by 0.9 percent for every 1-percent reduction in price) would increase its spending by 15 percent due to the credit.

limit, which prevents taxpayers from earning a credit on more than 50 percent of their current spending. The proposed credit retains this feature. The drawback of this provision is that taxpayers whose current spending is more than double their base amount receive only a 10-percent incentive to increase their spending further.

We believe that the reduced rate for companies with rapidly growing expenditures is an acceptable tradeoff for guarding against unduly large revenue costs. However, we would not recommend raising the 50-percent limit further—to 75 percent, for example—since this is likely to reduce the marginal incentive to less than 5 percent for a large number of firms. (See p. 49.) In a later section we examine an alternative means of reducing the credit's revenue cost.

Since the base of the proposed credit would be fixed, rather than a moving average, the 50-percent limit would not discriminate against corporations whose research spending fluctuates from 1 year to the next. This is because taxpayers' bases under the new credit would increase steadily and would not be sensitive to changes in their spending behavior.

Periodic Review Is Needed to Control the Credit's Cost and Maintain the Strength of Its Incentive in the Long Run

Given the uncertainty over the future correlation between the rate of growth in GNP (or any alternative index) and R&E growth rates, periodic review of the credit would be essential to prevent excessive revenue losses and to ensure that large numbers of companies are not excluded from the proposed credit. The House and Senate bills require Treasury to examine the revenue cost and availability of the credit every 5 years.

One potential problem with the proposed credit is that the spending distribution across growth rates could shift to the right, causing the cost of the credit to expand substantially. If this occurs, the index can be recalibrated so that in 1996 the value of the index will bear roughly the same proportion to the 1990 value as 1995 aggregate qualified spending bears to aggregate 1990 spending. This adjustment would keep the total revenue cost from rising to unacceptable levels after 1995, but it would not address the problems that would result if spending growth rates varied substantially across companies.

A company's spending during the historic base period may not predict its future spending behavior. Some industries or companies may have been in an uncharacteristically low spending phase during that period and, if their spending returns to normal levels in future years, they may exceed their base spending by large amounts for many years. On the

other hand, companies that were in an uncharacteristically high spending phase during the base period would be at a disadvantage in later years. One approach to correcting extreme divergences from base spending over time is to have certain companies update their bases every 5 years. For example, companies that spend less than 75 percent of their base amount in 1995 could be allowed to use a more recent period of years for computing their historic base spending amount. Companies at the other extreme—those exceeding their base by at least 50 percent, for example—could be required to update their bases. Companies knowing that they would be allowed or required to update their bases in 1996, if their 1995 spending is too low or too high, would have some incentive to delay their spending from 1995 to 1996.

The Optional Credit Would Extend the Credit to Some Below-Base Taxpayers at the Cost of Reducing Incentives to Others

The proposed credit allows taxpayers to choose a lower base amount and a lower rate for computing their credit. This would provide some incentive to taxpayers who would not have access to the regular credit. The proposal allowing taxpayers to take a 7-percent credit for spending above 75 percent of their regular base would provide many more taxpayers with some incentive to increase their spending. The incentive provided under the optional credit would be much lower than the regular credit, however, and there would still be some taxpayers with spending below 75 percent of their base receiving no incentive to increase their spending above what they would have spent without the credit.

As long as the optional computation is provided, some companies qualifying for the regular 20-percent credit will find it advantageous to use the lower optional rate. Specifically, as shown in table 4.4, companies in which current spending is greater than their base-period spending, but not more than 13.5 percent greater, would find it advantageous because they would receive a larger amount of credit. As a result, the proposed credit provides a 7-percent marginal incentive to these firms with slow spending growth, which is lower than the regular 20-percent rate but higher than the average effective rate of credit under current law. If the actual distribution of expenditures in 1990 is similar to that shown in figure 4.2, then about one-quarter of all qualified research expenditures would be made by companies facing the 7-percent rate of credit. The 21 hypothetical cases in table 4.4 show the credits earned under the regular and optional credit computation at various research spending growth rates.

Table 4.4: Comparison of the Amount of Credit Earned at Various Growth Rates Under Regular and Optional Methods of Computing the Credit

Case	Base spending	Current spending	Regular credit	Optional credit
1	$100	$99	$0.00	$1.68
2	100	100	0.00	1.75
3	100	101	0.20	1.82
4	100	102	0.40	1.89
5	100	103	0.60	1.96
6	100	104	0.80	2.03
7	100	105	1.00	2.10
8	100	106	1.20	2.17
9	100	107	1.40	2.24
10	100	108	1.60	2.31
11	100	109	1.80	2.38
12	100	110	2.00	2.45
13	100	111	2.20	2.52
14	100	112	2.40	2.59
15	100	113	2.60	2.66
16	**100**	**113.5**	**2.70**	**2.70**
17	100	114	2.80	2.73
18	100	115	3.00	2.80
19	100	116	3.20	2.87
20	100	117	3.40	2.94
21	100	118	3.60	3.01

The problem of the optional credit reducing the incentive provided to some companies with above-base current spending cannot be avoided without causing the greater problem of giving some companies an incentive to reduce their spending. If companies with above-base current spending were forced to use the regular credit, companies in which planned spending would have exceeded base by less than 9 percent (companies 2 through 10 in table 4.4) would face an incentive to reduce this spending to 99 percent of base. Doing so would allow them to use the optional computation and earn a credit of $1.68 rather than a credit of $1.60 or less.

The Rate of the Optional Credit Cannot Be Increased Without Lowering the Full Credit's Cost Effectiveness

One problem with providing the optional credit is that many taxpayers (including some that could qualify for the regular credit) would receive an effective incentive of only 7 percent. It would be desirable to give these taxpayers a higher rate for the optional credit. Unfortunately, this cannot be done without drawing an even larger number of taxpayers out of the regular credit and into the optional credit. Taken to extreme, if

the rate of the optional credit is set equal to the regular credit's 20-percent rate, all taxpayers should choose the optional credit because of its lower base. A 20-percent single-rate credit with the lower base would be much more costly than the proposed credit.

To make the single-rate credit revenue equivalent to the proposed credit, the single rate would have to be set well below 20 percent. The exact rate that would provide revenue equivalence would depend on the distribution of spending across growth rates. A range of examples is presented in appendix V to demonstrate this point. The examples also demonstrate that, whatever the distribution of spending, a revenue-equivalent, single-rate credit would have a lower average effective rate and, thus, a lower stimulative effect than the proposed credit.

As one example, if the distribution of spending is similar to that shown in figure 4.2, the proposed credit would have an average effective rate of between 16 and 17 percent and would cost the government about $4.40 for every $100 of research spending. By comparison, a credit with only one rate and the same base as the proposed optional credit (i.e., 75 percent of the full base) could have a rate no greater than 11 percent if its cost were to be kept to the same $4.40 per $100 of spending.

Locking Taxpayers Into the Optional Computation May Reduce the Credit's Effectiveness

Under the proposed credit, taxpayers that choose the optional credit computation for a given year must use that method of computation in the 2 succeeding years as well. The purpose of this provision is to prevent taxpayers from delaying research spending by shifting expenditures from 1 year to the next in order to gain a larger credit. In the absence of the lock-in, a taxpayer whose spending is less than 13.5 percent above his base amount in one year and whose planned spending for the next year would be more than 13.5 percent above the base for that year, could increase his combined credit for the 2 years by shifting some spending from the first year (when it would earn only a 7-percent credit) into the second year (when it would earn a 20-percent credit).

One problem with the lock-in provision is that many taxpayers are likely to end up using the optional computation and receiving a small incentive in years when they would otherwise have chosen the regular credit and received a much larger incentive. Taxpayers whose spending is substantially less than 13.5 percent above base in 1 year are likely to choose the optional credit, even if they expect their spending to be a little more than 13.5 percent above base in each of the next 2 years. Any time that a taxpayer that could qualify for the regular credit uses the optional

computation instead, the incentive provided per dollar of the credit is reduced.

Extending the Credit to Start-Up Companies Is Reasonable

The congressional and administration proposals would permit start-up companies to earn credits by allowing their R&E expenditures to qualify for the credit, as long as they intend to use the results of the research in the active conduct of a future trade or business. The Small Business Administration reports that small firms (which most start-up companies are) have created more than 20 times more innovations per dollar of credit claimed than have larger firms.[10] This finding reflects, at least in part, the fact that small firms have done a large amount of research that has not been rewarded by credits. It does not imply that each million dollars of credit given to small firms would lead to 20 times the innovations that would result from $1 million being given to large firms. Furthermore, the number of innovations produced from a given amount of research spending says little about the social value of the research. Nevertheless, there is no evidence to suggest that the research spending of start-up companies is any less deserving of the credit than is the spending of established firms.

Under the congressional proposal, start-up companies would be assured of earning a 20-percent credit on 50 percent of their qualified spending for the first 3 years of their existence. However, many of these companies may not be able to make use of their credits initially, due to the lack of taxable income. This delay in the companies' ability to use their credits would reduce the effective rate of credit that they receive to less than 10 percent.

[10]See the testimony of Honorable Frank S. Swain, Chief Counsel for Advocacy, U.S. Small Business Administration before the Subcommittee on Taxation and Debt Management of the Committee on Finance of the U.S. Senate on Miscellaneous Tax Bills, July 12, 1988.

Reducing the Section 174 Deduction by 50 Percent or 100 Percent of the Credit Claimed Is Effectively the Same as Reducing the Rate of the Credit

Current law requires a corporation to reduce its section 174 deduction by an amount equal to 50 percent of its claimed R&E credit. This provision, which would be retained in the congressional proposal, reduces the effective rate of the credit by 17 percent (half of the 34-percent corporate rate).[11] This reduction means that, instead of the effective rates of 0, 7, 20, or 10 percent shown in figure 4.1, a company would receive an effective rate of 0, 5.8, 16.6, or 8.3 percent. The weighted average effective rate would be about 13.6 percent, if the distribution of spending were similar to the one shown in figure 4.2.

The administration has proposed that the section 174 deduction be reduced by the credit's full amount in order both to limit the revenue cost and to treat all sources of federal support for R&E similarly for tax purposes.[12] This treatment would reduce the effective rate of the credit by 34 percent. Under this proposal, a company would receive an effective rate of 0, 4.6, 13.2, or 6.6 percent and the weighted average effective rate with the figure 4.2 distribution would be about 10.8 percent. Treasury has estimated that reducing the deduction by 100 percent, rather than by 50 percent, would save more than $1.6 billion over the first 5 years that the credit is in effect.

Modifications to the Proposed Credit Could Save Revenue

We pointed out earlier in this chapter that the credit can have the greatest stimulative effect on research spending if it is designed to reward only the research spending that a firm undertakes above and beyond the amount it would have spent in the absence of the credit. Unfortunately, it is impossible to determine this amount accurately. The 3-year moving-average base in current law and the proposed fixed indexed base are approximations to measure qualified spending without the credit. These approximations are likely to be less accurate for companies with relatively high rates of growth in research spending; much of that growth would have occurred without the credit. Improving the accuracy of the base would be the best way to reduce the amount of credit that companies receive for spending that they would do anyway. However, there is no practical way to measure the ideal base for each company and thus,

[11]Without this provision, a corporation that increased its R&E spending by $100 could receive a tax credit of $20 and could earn a tax deduction worth $34 for that same $100. With the provision, the same corporation would receive a $20 credit but the value of its tax deduction would be reduced to $30.60 (or [$100 - $10] x 34 percent). Therefore, by claiming the credit, the corporation would receive $16.60 more than it would have received if it did not claim the credit ($20 + $30.60 - $34). This $16.60 is 17 percent less than $20.

[12]A Treasury official has testified that research costs funded by federal grants are not tax deductible. See Ross (1988). Currently, research costs offset by credits are partially deductible.

no way to determine how much the actual base diverges from the ideal base.

Even so, there are several ways to compensate for the inaccuracies of the base and thereby reduce the amount of credit that companies receive for spending they would have done without the credit. One approach would simply be to lower the rate of the credit.[13] This would reduce the amount of credit earned by all companies, whether the credits are deserved or not, and lower each company's incentive to increase spending.[14]

A second approach would be to raise the minimum base limit so that only companies spending well above their base would earn less credit. Increasing the limit from 50 percent to 75 percent of current spending, for example, would substantially reduce the amount of credit earned by companies that spend at least 33.3 percent above base. This approach more accurately targets the companies that would be earning most of the "undeserved" credit, but it would not reduce their "undeserved" credits without drastically reducing the credit that these companies would earn on true additional spending.[15] The marginal incentive provided to most of these companies would fall by 75 percent, from 16.6 percent to 4.2 percent (after the section 174 adjustment).[16]

A third approach would be to increase the fixed base by a set percentage for all companies that select the regular credit. A small upward adjustment in the base would reduce the amount of credit earned by companies selecting the regular credit. However, since a company selecting the regular credit would still receive $0.20 for each dollar of spending above the adjusted base, the incentive for most companies to increase their spending would remain unchanged. On the other hand, when the amount of credit that can be earned under the regular computation is reduced, more companies are encouraged to select the optional computation. As we show in appendix VI, the number of companies that would make this

[13]Equivalently, the sec. 174 deduction could be offset by a larger percent of the credit claimed, as recommended by Treasury.

[14]By "deserved" we mean that the credits were earned for spending that would not have been done without the credit.

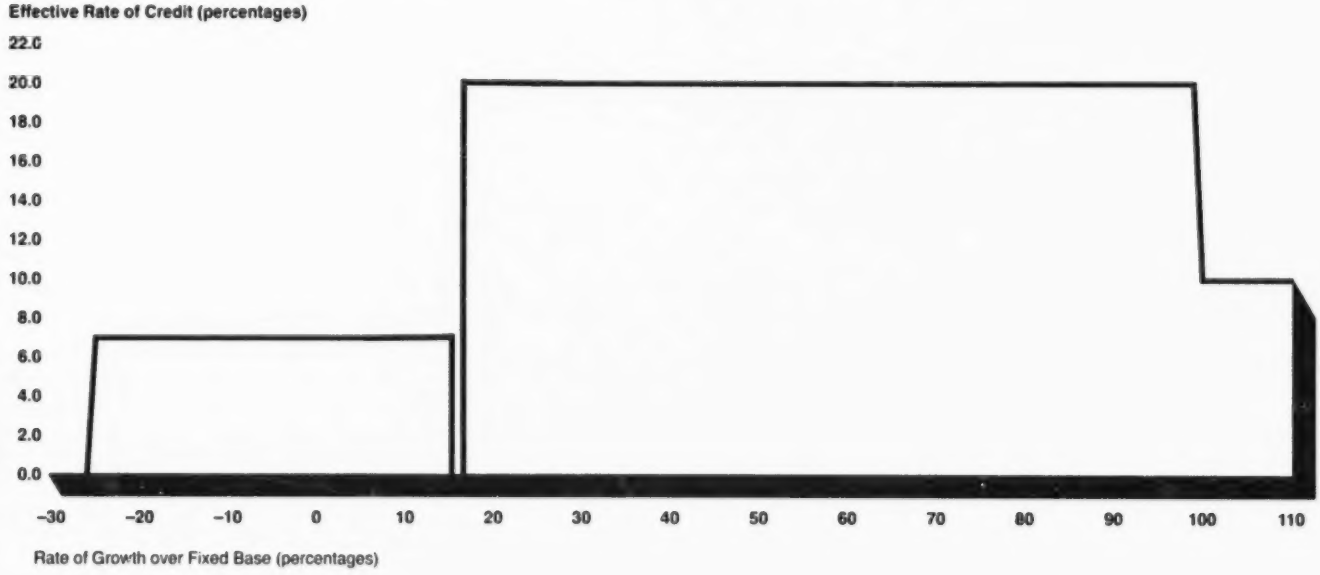
[15]See appendix VI for an explanation of how this would work.

[16]Each additional dollar that one of these companies spends would increase its base by $.75 and its credit by $.20(1 - .75), or $0.05.

switch can be reduced by placing a ceiling on the amount of credit that each company could earn under the optional computation.

Under this approach, if the base of the regular credit were increased by 2 percent, and the computation of the optional credit were adjusted to make it less attractive to users of the regular credit, the rate structure of the credit would change from that shown in figure 4.1 to the structure shown in figure 4.3.[17] Under the proposed credit, companies would have an incentive to choose the optional computation, unless their spending increases by more than 13.5 percent. Under the modified proposal companies would be better off with the optional credit unless their spending increases by more than 15 percent. Furthermore, the modification would cause a very narrow zero-rate interval to occur in the rate structure at the point where current spending exceeds base by 16 percent.

Figure 4.3: Effective Rates of Modified Proposal Across Expenditure Growth Rates



Each company whose spending growth would take it beyond the zero-rate interval would have its total credit reduced. We estimate that with

[17] The revised rules for the credit's computation are presented in appendix VI.

this revision the credit would cost between $78 and $103 million less in 1990 if the annual rate of growth in qualified spending from 1985 through 1990 were between 8 and 12 percent and if the distribution of spending in 1990 were not very different from the distribution presented in figure 4.2. In later years, the revenue savings would grow at least as rapidly as the rate of growth in GNP. If the actual distribution were further to the right than the figure 4.2 distribution, revenue savings would be greater; if the distribution were further to the left, the savings would be less.

The large majority of companies would receive the same incentive to increase their spending under this modified proposal as they would have under the congressional proposal. (See figures 4.1 and 4.3.) Only companies in which current spending would have ended up between 14 and 16 percent above base under the unrevised proposal would have their incentive reduced by the revision. Thus, a company that would end up spending 14 or 15 percent more than its fixed base would receive a 7-percent credit (rather than a 20-percent credit) on its last 1-percent increment of spending. Furthermore, a company that would end up spending 16 percent more than its fixed base would be given no credit on its last 1-percent increment of spending. If the zero-rate interval were kept narrow and if the companies in this position were to account for a relatively small proportion of total spending, then the reduction in the credit's overall stimulative effect would be minor.

Conclusion

Restructuring the credit to eliminate the link between current R&E spending and future base expenditures will raise the effective rate of the credit. However, several proposed changes to the credit, such as indexing the credit's base to the growth in GNP, could increase the credit's cost and reduce its incentive effect over time. Whether these effects occur will depend on the distribution of R&E spending across companies with different R&E spending growth rates. If more R&E spending is done by companies that are increasing their R&E spending more rapidly than GNP, or any alternative index, the revenue costs will grow. In the long run, if this trend continues, an increasing number of companies would become subject to the 50-percent limit and thus face an effective rate of 10 percent rather than a 20-percent rate. On the other hand, if the index grows more rapidly than R&E spending, more companies would be unable to use the credit because their spending would be below base. Because of the uncertainty over the future correlation between growth rates in any index and R&E spending, periodic review of the credit will be

essential to prevent excessive revenue losses and ensure that large numbers of companies are not excluded from the credit.

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Definition of the R&E Tax Credit

Section 44F effective July 1, 1981	Section 41 effective for tax years beginning after 1985
Expenditures that qualify for the credit	
Research expenditures incurred in the taxpayer's trade or business that are for research in the experimental or laboratory sense.	Same, plus must also be research undertaken to discover information that is technological in nature and when applied is intended to be useful in developing a new or improved business component for sale or use in the taxpayer's trade or business.
In-house research expenditures for wages and supplies, lease of personal property, and 65 percent of contract research expenditures paid or incurred by the taxpayer to any person for qualified research.	Same, except that for leases, only payments for right to use computers in the conduct of qualified research.
Sixty-five percent of payments by a corporate taxpayer to universities and certain other nonprofit, tax-exempt research organization for doing basic research.	Separate 20-percent basic research credit.[a]
Costs of obtaining a patent (not eligible if acquiring another person's patent).	Same.
Expenditures that do not qualify for the credit	
Amounts paid for overhead, general and administrative services, or indirect wage expenditures.	Same.
Research activities after commercial production of the business component costs to tool up for production. (Exclusion does not preclude costs of significant improvement to an existing product from eligibility.)	Same.
Adapting products for a particular customer's requirements or needs.	Same.
Doing efficiency surveys, or activities related to marketing research.	Same.
Research related to reproducing an existing business component.	Same.
Research in the social sciences (including business management, economics, and behavioral sciences), arts, or humanities.	Same.
Research in connection with literary, historical, or similar projects involving the production of property.	Same.
Research funded by any person or governmental entity other than the taxpayer, whether by grant, contract, or other agreement.	Same.
Research outside the United States.	Same.
Research conducted by a firm not yet carrying on the trade or business in which the research is conducted.	Same.
Research to find and evaluate mineral deposits, including gas and oil.	Same.
Acquisition or improvement of land or of certain depreciable or depletable property used in research.	Same.

[a]Effective beginning after tax year 1986.

Note: Under each section, the listings of expenditures that did and did not qualify for the credit are from the Code provisions themselves or from rules that implemented the provisions. The Tax Reform Act of 1984 renumbered the Code section to 30 but made no substantive changes to the credit.

Questionnaire Objective, Scope, and Methodology

The objective of our questionnaire was to obtain data on the R&E tax credit from IRS revenue agents who had audited Coordinated Examination Program taxpayers. We mailed 360 questionnaires June 3, 1988.

The questionnaire asked for the results of the most recently closed audit. The closed audit must have covered 1981 or thereafter because 1981 was the first year the credit could be claimed. We defined a closed audit as one for which the IRS Examinations staff had finished their work and the taxpayer's protest period had expired.

Although Examinations may have closed the case, the taxpayer may have appealed the Examinations staff adjustments to the IRS Office of Chief Counsel's Appellate Division. The administrative appeals process, on average, takes 2 years. This process often results in changes to the decisions made by the Examinations staff. However, requiring this process to have been completed would have resulted in very few closed audits.

As it was, audits covering tax year 1981 had not been closed for 10 percent of the respondents. Furthermore, tax year 1981 or 1982 was the most recently closed year for 53 percent of the corporations that had had their credit audited.

Projection of Sample Results

The results of our analysis are representative of audits of the R&E credit claimed by the 1,433 corporations in the Coordinated Examination Program. Each random sample corporation represents a portion of the larger universe, and we projected the data from the results of these respondents to the universe in proportion to their size in the universe. This allows us to estimate the universe statistics on the basis of sample statistics.

Sampling Errors

We computed sampling errors for estimates in our review. Our sampling plan was designed to provide a sample size that would have an expected sampling error of not greater than 5 percent at the 95 percent confidence level. However, the actual sampling error for any characteristic, such as the number of corporations that had claimed the credit, depends upon the percentage of the sample having that characteristic and the variance of the characteristic. Table II.1 presents the sampling errors for the major figures from the questionnaire used in this report.

Table II.1: Confidence Limits for Selected Universe Estimates

Description of item	Universe estimate	Upper limit	Lower limit
Percent of audited corporations that claimed the credit	52%	59%	45%
Percent of corporations that had their credit audited	74	83	66
Percent of corporations that had their credit adjusted by IRS revenue agents	79	88	70
Percent of revenue agents who adjusted the credit for the four most common reasons			
Adapting existing capability	46	58	34
Routine or cosmetic alteration	41	53	30
Overhead and administrative expenses	40	52	29
Ordinary testing	25	35	15
Percent of revenue agents who said they audited the four most common reasons and found the issue difficult to audit			
Adapting existing capability	63	76	51
Routine or cosmetic alteration	69	82	56
Overhead and administrative expenses	58	72	44
Ordinary testing	75	85	65
Percent of revenue agents who found at least one aspect of the credit difficult to audit	54	64	43
Percent of revenue agents who found the definition of qualified expenditures to be unclear	20	29	12
Percent of corporations for which the audit of tax year 1981 had not been closed	10	10	10
Percent of corporations for which 1981 or 1982 was the most recent closed audited tax year	53	63	42
(estimate in billions)			
Amount of credit claimed			
For firms that had their credit decreased	$1.551	$1.720	$1.383
For firms that had their credit increased	.027	.043	.012
For firms that had no adjustment to their credit	.249	.265	.233
Total	**$1.827**	**$2.010[a]**	**$1.646[a]**
Amount of credit adjusted			
For firms that had their credit decreased	($.368)	($.468)	($.269)
For firms that had their credit increased	.007	.014	.001
For firms that had no adjustment to their credit	0	0	0
Total	**$.361**	**$.464**	**$.258**

Note: Confidence interval (95 percent).

[a]The individual confidence limits do not sum to the total.

We attempted to follow up on 51 corporations that, according to revenue agents, disagreed with part or all of the additional taxes they proposed.[1] These disagreements would have ended up in the IRS Appeals Division. Appeals has an automated system for tracking large cases. These large cases, however, are defined differently from large cases in Examinations. A large case in Appeals is one in which the taxpayer has disagreed with at least $1 million in additional taxes and penalties.

For these cases, the Issue Tracking system, implemented in 1986, tracks the 5 or 10 largest proposed adjustments by section of the Internal Revenue Code. Thus, the R&E credit would be tracked as section 41, 30, or 44F, depending on the tax year in dispute. If the total disagreement in an administrative appeal is at least $1 million then Appeals tracks the five largest issues, if the appeal amount for the issue is at least $100,000. If the total disagreement for an administrative appeal is at least $10 million, then Appeals tracks the 10 largest issues so long as the disputed amount for the issue is at least $100,000.

Appeals was able to find information on 37 of the 51 corporations. The remaining 14 administrative appeals were not in the Issue Tracking system, because the total disputed amount may not have met the system's threshold. In other instances, the administrative appeal may have been closed before the system was activated. The information gathered on the tracked cases showed:

- One case was returned to Examinations for further development of the issues.
- The administrative appeal for 11 corporations had been completed. In four cases, Appeals upheld Examinations' position on the credit. One case was decided in favor of the corporation, and the remaining six cases were decided partly in favor of the corporation and partly in favor of the government. These cases involved as many as 26 issues. The amount of the R&E credit disputed was not tracked for four of these cases. The total amount in dispute for all issues (not just R&E) in the 11

[1]We use actual numbers and dollar amounts, instead of projected estimates, throughout this report when referring to Appeals cases.

cases was $517 million.[2] For the 11 closed cases, Appeals sustained Examinations' position for 57 percent of the disputed credit amount. Overall, however, Appeals sustained 34 percent of the total amount disputed.

- Twenty-six cases were still open or active. These cases involved at least two issues. Revenue agents reported that these 26 corporations disputed $53 million of adjustments related to the R&E credit; the Appeals tracking system showed that the total amount in dispute for all 26 cases was $1.6 billion.[2]

[2]The total amount in dispute is not strictly comparable to the R&E tax credit disputed amount because the amount of credit is actual tax dollars as opposed to deductions from gross income.

Research and Experimentation Tax Credit Survey

ID ___ ___ ___ ___

U.S. GENERAL ACCOUNTING OFFICE

Research and Experimentation Tax Credit Survey

(Code 268347)

INTRODUCTION

In the latter half of 1988, Congress may convene hearings to decide whether the Research and Experimentation (R&E) Tax Credit should be modified and/or extended. The Joint Committee on Taxation has asked the General Accounting Office to (1) assess the credit's effectiveness in stimulating investment and (2) determine how IRS ensures that taxpayers that claim the credit comply with the Internal Revenue Code. As a part of this effort, we are surveying IRS team coordinators to obtain information on audits of large corporate taxpayers who have claimed the credit. This questionnaire asks you about the most recent audit closed by Examination of the taxpayer identified in question 1.

The questionnaire should be completed by you or someone you designate. Your participation in this survey is voluntary. However, the Congress would obviously be able to make a more informed decision with your help. The information you provide will be treated confidentially and will only be presented in aggregate form in our report and/or testimony to the Congress. We appreciate your assistance.

Most of the questions in this questionnaire can be completed by checking a box. A few require a brief narrative entry. It should take from 20 to 30 minutes to complete. If you have any questions, please call Ms. Linda Darby at (FTS) 272-7904 or (202) 272-7904.

Please return the completed questionnaire in the enclosed pre-addressed envelope within 10 days of receipt. In the event the envelope is misplaced, the return address is:

U.S. GENERAL ACCOUNTING OFFICE
General Government Division
Ms. Linda Darby
1440 New York Avenue, N.W.
Suite 400
Washington, D.C. 20005

Again, many thanks for your cooperation.

In case we need to follow up, please provide the following information:

NAME: _____

DISTRICT: _____

TELEPHONE NUMBER: (FTS) _____

(COMMERCIAL) ( ) _____

The following documents may be useful to you when completing this questionnaire. Please send copies of these documents along with the completed questionnaire:

a. Sections of the report transmittal & RAR which are related to the R&E credit

b. 5701s on the R&E credit (Do not include responses.)

c. Pages 1 and 3 of Tax Form 1120

d. Tax Form 6765 and any attachments

NOTE: AUDITS OF TAXPAYERS WHO FILE A CONSOLIDATED RETURN SHOULD BE TREATED AS ONE AUDIT. AUDITS OF TAXPAYERS WHO FILE SEPARATE RETURNS SHOULD BE TREATED AS SEPARATE AUDITS.

* * * * *

1. Taxpayer's name: _____

2. Did this taxpayer claim the R&E tax credit on tax form 6765 for the last audit closed by Examination? (CHECK ONE.)

   1. [ ] Yes (CONTINUE WITH QUESTION 3.)

   2. [ ] No (STOP. PLEASE RETURN THE QUESTIONNAIRE.)

3. Did the IRS audit the R&E credit claimed by this taxpayer during this audit? (CHECK ONE.)

   1. [ ] Yes (CONTINUE WITH QUESTION 4.)

   2. [ ] No **(SKIP TO QUESTION 14.)**

4. What was the principal industry of the taxpayer for which this audit was conducted? (CHECK ONE.)

   1. [ ] Aerospace

   2. [ ] Data processing

   3. [ ] Electronic components

   4. [ ] Gas and electric utilities

   5. [ ] Pharmaceuticals

   6. [ ] Telecommunications

   7. [ ] Other (please specify)

   _____

5. What was the completed cycle for this audit (e.g., 1981-1982)?

   _____

6. What was the amount of R&E credit expenses claimed by the taxpayer for each year? (ROUND TO THE NEAREST DOLLAR.)

   $ _____ First year

   $ _____ Second year

7. Did the IRS make an adjustment to the taxpayer's R&E credit expenses in the first or second year? (CHECK ONE.)

   1. [ ] Yes (CONTINUE TO QUESTION 8.)

   2. [ ] No **(SKIP TO QUESTION 11.)**

8. What was the total dollar IRS adjustment to the taxpayer's R&E credit expenses for each year? (ROUND TO THE NEAREST DOLLAR.)

   $ _____ First year

   $ _____ Second year

9. How much of the IRS adjustment, if any, did the taxpayer agree with for each year? (ROUND TO THE NEAREST DOLLAR.)

   $ _____ First year

   $ _____ Second year

10. Using the following list of possibilities, please tell us the reasons why IRS adjusted the R&E credit expenses of this taxpayer. (CHECK ALL THAT APPLY.)

1. [ ] Expenditures were for research conducted outside the United States

2. [ ] Expenditures were for research conducted in the social sciences or humanities (such as research on psychological or sociological topics or management feasibility studies)

3. [ ] Expenditures were paid or incurred before commencing a trade or business

4. [ ] Expenditures were used to purchase a patent, model, or production process

5. [ ] Expenditures were used to ascertain the existence, location, extent or quality of mineral deposits including oil and gas

6. [ ] Expenditures were incurred to construct copies of prototypes after construction and testing of the original model(s) had been completed

7. [ ] Expenditures were for ordinary testing or inspecting of materials or products for quality control or costs for efficiency surveys, management studies, consumer surveys, advertising or promotion

8. [ ] Expenditures were for routine, periodic, or cosmetic alteration or improvement of existing products, commercial production lines, or other ongoing operations

9. [ ] Expenditures were for routine design of tools, jigs, molds, and dyes

10. [ ] Expenditures were for overhead and administrative expenses

11. [ ] Expenditures were for engineering follow-through or trouble shooting during commercial production

12. [ ] Expenditures were for adapting an existing capability to a particular requirement or customer's need as part of a continuing activity (e.g., adapting computer software)

13. [ ] Expenditures were for routine data collections

14. [ ] Reseach was funded by the government

15. [ ] Research was funded by a non-government entity

16. [ ] Other (please specify) _____

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11. Describe the audit techniques that you used in auditing the R&E tax credit. (ATTACH ADDITIONAL SHEETS IF NECESSARY.)

12. Are these auditing techniques similar or different than those used to audit other credits? (CHECK ONE.)

1. [ ] Similar

2. [ ] Different (PLEASE EXPLAIN DIFFERENCES. ATTACH ADDITIONAL SHEETS IF NECESSARY.)

13. For this taxpayer, was it difficult or easy to decide whether the following types of expenditures were qualified under the applicable tax code? (CHECK ONE BOX IN EACH ROW.)

TYPES OF EXPENDITURES	Not applicable (1)	Very difficult (2)	Difficult (3)	Neither difficult nor easy (4)	Easy (5)	Very easy (6)
1. Research conducted outside the U.S.						
2. Research conducted in social sciences or humanities						
3. Expenditures paid or incurred before commencing a trade or business						
4. Expenditures used to purchase a patent, model, or production process						
5. Expenditures used to ascertain the existence, location, extent, or quality of mineral deposits, including oil and gas						
6. Expenditures incurred to construct copies of prototypes after construction and testing of the original model(s) had been completed.						
7. Expenditures for ordinary testing or inspecting of materials or products for quality control or costs for efficiency surveys, management studies, consumer surveys, advertising, or promotion						
8. Expenditures for routine, periodic, or cosmetic alteration or improvement of existing products, commercial production lines, or other ongoing operations						
9. Expenditures for routine design of tools, jigs, molds, and dyes						
10. Expenditures for overhead and administrative expenses						
11. Expenditures for engineering follow-through or trouble shooting during commercial production						

CONTINUED ON NEXT PAGE

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QUESTION 13 CONTINUED

TYPES OF EXPENDITURES	Not applicable (1)	Very difficult (2)	Difficult (3)	Neither difficult nor easy (4)	Easy (5)	Very easy (6)
12. Expenditures for adapting an existing capability to a particular requirement or customer's need as part of a continuing activity (i.e., adapting computer software)						
13. Expenditures for routine data collections						
14. Reseach funded by the government						
15. Research funded by a non-government entity						
16. Other (Please specify) _____						

SKIP TO QUESTION 15.

14. Please tell us the reason(s) the RAE credit was not audited.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

6

15. If you have additional comments on IRS audits of the R&E tax credit in the NCEP or RCEP programs, please provide them in the space below. Attach additional sheets, if necessary.

THANK YOU FOR YOUR COOPERATION.
PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE AND SUPPLEMENTARY DOCUMENTATION IN THE ENCLOSED PRE-ADDRESSED ENVELOPE.

Scope and Methodology for Analyzing the R&E Credit's Effectiveness

To assess the effectiveness of the R&E credit, we estimated the amount of additional spending from 1981 through 1985 that could be attributed to the credit. We also compared this amount of spending to the amount of revenue foregone due to the credit over this same period. In this appendix, we (1) describe the corporate taxpayer data base that we used for our analysis; (2) explain how we estimated the effective rates, aggregate qualified research expenditures, and the revenue cost of the credit; (3) explain how we estimated the amount of spending stimulated and the amount stimulated per dollar of revenue cost; and (4) compare the qualified research spending that corporations reported on their tax returns with the research spending that the same corporations reported to the Securities and Exchange Commission (SEC).

The Corporate Taxpayer Data Base Used in GAO's Analysis

The effective rate of credit (ERC) should be calculated on a taxpayer-by-taxpayer basis because the following factors upon which its value depends are taxpayer-specific.

- One factor is the amount of credit the company earned by spending an additional dollar on research. This amount of credit will depend on the company's expenditure status, i.e., whether its current qualified research spending is below its base-period amount, greater than the base-period amount but not more than twice as great, or more than double the base-period amount.
- The second factor is whether an additional dollar of current spending reduces the amount of credit earned by the company in later years. This condition depends on the company's expenditure status in the 3 years immediately following the current year.
- The third factor is when the company is able to make use of the credits that it earns each year.

In short, data are required on each corporation's expenditure status and tax status (its ability to make use of its available credits) over a number of years. Once effective rates are computed for each corporation in the population of interest, a population-wide weighted average effective rate should be computed in order to make generalizations about the credit's overall impact. This rate can be obtained by weighting each corporation's effective rate by the amount of that corporation's research expenditures, totaling the weighted rates over corporations, and dividing by the population's total research expenditures.

The ideal population for our study would have included all taxpayers that spent money on qualified research activities at any time since 1980.

We would have liked to have had data for all of these taxpayers for the years 1980 to 1987 but such data did not exist. The only source of information concerning qualified research expenditures and earned R&E tax credits comes from the forms 6765 that taxpayers file when they are either earning or using an R&E credit. IRS does not record expenditure data for all taxpayers, but SOI does collect this information for a representative sample of corporations each year. SOI attempts to include all corporations with assets of at least $50 million in its sample every year.[1]

We obtained extracts from each of SOI's annual corporate samples from 1981 through 1985, the latest year available. These extracts contained selected data items for all corporations with assets greater than or equal to $50 million. We also obtained selected data for corporations of the same size from IRS' BMF and RTF for tax years 1978 through 1987. Corporations were identified in each of these computer files by their employer identification numbers (EIN). We constructed a separate data record for each corporation by sorting and merging the seven files according to EINs. Each resulting record contained up to 10 years of tax data.

The task of constructing and verifying the individual corporation time series proved to be too time-consuming, so we decided to limit our population to companies with at least $250 million in assets. Out of this population, we selected corporations that (1) were included in each of SOI's annual samples from 1981 through 1985 and (2) filed a form 6765 in at least one of those years.[2] We eliminated corporations with only partial time series of data because our effective rate calculations required data for each year in our time frame. Our sample was further reduced as we dropped from the sample cases with missing or inconsistent data.

Our data preparation included a set of computer tests for data inconsistencies to supplement SOI's own data editing and tests. We resolved some of the inconsistencies by referring to copies of actual tax returns—some maintained at SOI and others collected from revenue agents we surveyed. More importantly, however, we carefully checked the consistency of the data for individual corporations over time. Specifically, we corrected cases where IRS had assigned more than one EIN to a corporation over the

[1]A small percentage of these corporations is missed each year because their returns are unavailable at the time of sampling. Corporations with assets of less than $50 million are sampled at rates varying between 0.35 percent and 100 percent, depending on selected attributes.

[2]We believe that corporations that never filed a form 6765 during the 5-year period accounted for a very small share of total qualified research spending over that period. Therefore, the exclusion of these corporations should not significantly affect the representativeness of our sample.

time period studied. We deleted return information in cases where a corporation's tax return for a given year appeared in more than one of the annual samples. In some cases, we were able to fill in missing data by referring to the copies of actual returns. We also imputed data in a limited number of cases to fill in missing values that were required for our analyses. We imputed only when one or two data items were missing for a particular corporation and when related data for that corporation enabled us to estimate the values for the missing items.

Our final sample consisted of 800 corporations that accounted for 69 percent of qualified research expenditures reported by all corporations between 1981 and 1985. Our results are representative of corporations that do research and in which assets exceed $250 million; such corporations account for about 78 percent of the credit claimed between 1981 and 1985. Our results should also accurately represent the other large corporations that do research (those with assets between $50 million and $250 million) that account for an additional 8 percent of the credit that was claimed. We cannot extend our generalizations to the small corporations that have claimed most of the remaining 14 percent of the credit (individuals, sole proprietors, and partnerships, combined, claimed a little over 1 percent of the credit). However, unless the spending behavior of these small corporations is markedly different from that of the larger corporations, our aggregate estimates should be unbiased.

Computing the Average Effective Rate of the Credit

The R&E credit is designed to reward companies for increasing their current-year spending above their average annual spending during the applicable base period. By spending an additional dollar in the current year the company may receive a current tax benefit. However, this additional spending also reduces the potential tax benefits that the company can earn in the 3 succeeding years. The ERC measures the net present value of the current benefit and the reductions in future benefits resulting from the firm spending an additional dollar on R&E. Our formula for computing the ERC for individual companies is an extension of the formula presented by Eisner, et. al. (1984), and was developed as follows:

- The amount of credit that a company earned by spending an additional dollar on research in 1981 depended on the relationship between its current and base spending in the following manner:

  Credit earned on an additional dollar = $.25 x Z81

where Z81 = 0 if current spending < base spending (company earns no credit if spending does not exceed base);

Z81 = .5 if current spending > 2 x base spending (effect of the 50 percent limit);

Z81 = 1 if base < current spending ≦ 2 x base.

- If the credit arising from this marginal expenditure could not be used in 1981, then the company discounted the value of the tax benefit:

  Discounted benefit = ($.25 x Z81)$(1+r)^{-X81}$

  where r = the company's discount rate;

  X81 = the number of years before the credit earned from the marginal spending can be used.

- Since the base for the company's credit in 1982 equaled the average of the company's 1980 and 1981 spending, the additional dollar spent in 1981 raised the 1982 base by $.50 and reduced the company's 1982 tax benefit in the following manner:

  Reduction of 1982 benefit due to an additional dollar of spending in 1981 = -.5($.25xY82)

  where Y82 = 0, when the marginal increase in the 1982 base did not affect the amount of credit earned in 1982 (i.e., when Z82 = 0 or Z82 = .5);

  Y82 = 1, when the marginal increase in the base did reduce the credit earned in 1982.

- If the credit that was lost in 1982 could not have been used until a later year anyway, then the benefit reduction should be discounted. Furthermore, when the company was making its decision in 1981 it would have discounted any negative effects in 1982 so that:

  Discounted reduction of 1982 benefit = $-.5($.25xY82)(1+r)^{-X82}(1+r)^{-1}$,

  where X82 = the number of years (counting from 1982) before the marginal 1982 credit was used.

- The additional 1981 expenditure similarly reduced the potential credit benefits that might have been earned in 1983 and 1984. The ERC is the sum of the discounted benefits and benefit reductions described above:

$$\begin{aligned} ERC81 = \; & .25[Z81(1+r)^{X81} - .5Y82(1+r)^{X82}(1+r)^{1} \\ & - 1/3\ Y83(1+r)^{X83}(1+r)^{2} \\ & - 1/3\ Y84(1+r)^{X84}(1+r)^{3}]. \end{aligned}$$

By the same line of reasoning:

$$\begin{aligned} ERC82 = \; & .25[Z82(1+r)^{X82} - 1/3\ Y83(1+r)^{X83}(1+r)^{1} \\ & - 1/3\ Y84(1+r)^{X84}(1+r)^{2} \\ & - 1/3\ Y85(1+r)^{X85}(1+r)^{3}]. \end{aligned}$$

The computation of ERC83 is similar to that of ERC82.

We were able to compute values for Z81 through Z83 and Y82 through Y85 for each of the 800 corporations in our sample directly from the expenditure information SOI extracted from each corporation's form 6765. If a corporation did not file a form 6765 in a given year, we presumed that the values of Z and Y for that year were zero. To compute values for X81 through X86, we needed to know when the corporations in our sample were actually able to use the credits they earned. Most corporations were able to use their credits in the years they were earned, and it was usually apparent from the tax returns when this was the case. It was also usually apparent when credits were carried forward from 1 year to the next. In the cases where it was not clear if a company had carried a credit back or forward, we constructed tax histories using data from the BMF and RTF files (in addition to the SOI files). These tax histories allowed us to estimate whether a corporation with excess credits in a given year had prior-year liabilities against which the credits could be offset. By estimating the amounts of credit that corporations carried back, we were able to complete our computations of X81 through X86 and to estimate the amount of credit that each corporation actually used in a given year (the sum of the amount used against that year's liability and the amount of any excess credit that was carried back from that year).

The final piece of information that we needed in order to estimate effective rates for each corporation was the value of r, the average corporate discount rate for 1981 through 1985. Since the exact value of this discount rate is unknown, we used a range of rates that, we believe,

includes the true rate. We set the lower bound of our range at 9 percent and the upper bound at 15 percent.[3]

Before we could compute weighted average effective rates from the rates for individual corporations, we needed to compute expenditure weights for each corporation for each year. We knew how much each corporation spent on qualified research in years when they filed a form 6765. If a corporation did not file a form 6765 for a given year, however, we had no record of its spending for that year. To fill in some of these gaps, we relied upon the relationships between currently reported expenditures and base expenditures. For example, if we were missing a corporation's current expenditures for 1983, we could impute them in the following way:

$$QS83 = 3 \times B85 - QS84 - QS82,$$

where B85 is the base spending amount that the corporation reported in 1985, and QS84 and QS82 are the current spending amounts that it reported in 1984 and 1982. Our 6 years of spending data (including 1980, which was reported on the 1981 form) gave us numerous, overlapping relationships to use. Seventy-five percent of total sample spending from 1981 through 1985 was done by corporations that filed forms 6765 every year. Corporations that filed at least two forms 6765 did much of the remaining spending. Therefore, we needed our imputations to fill in a relatively small percentage of the total sample spending that was missing each year.

We computed weighted average effective rates of credit for 1981 through 1983 by weighting each corporation's effective rate for a given year by its spending for that year, summing the weighted rates of all corporations for that year, and dividing by the total sample spending for the year. Table IV.1 shows the results we obtained using a range of three alternative discount rates.

[3]By comparison, Charles River Associates (1985) used 10 percent and 15 percent for the discount rate's lower and upper bounds when estimating ERCs for hypothetical companies. Collins (1986) estimated ERCs for a small sample of firms using the 10 percent and 15 percent alternatives for the discount rate. Dworin and Grubert (1987) used a 10 percent discount rate when computing ERCs for hypothetical firms and Altshuler (1988) used a 7 percent discount rate to estimate the ERC in 1981.

Table IV.1: Estimated Average Effective Rates of Credit Using Various Discount Rates

Assumed discount rate	1981	1982	1983
9%	2.0%	4.4%	3.5%
12	3.0	5.2	4.3
15	3.9	5.9	5.1

Source: GAO analysis of a subset of 800 corporations from SOI's annual samples of corporate income tax returns.

Ideally, to measure the R&E tax credit's incentive to companies in 1981, our estimate of ERC81 should have been based on the companies' anticipated spending patterns and tax liabilities when they made their 1981 spending decisions. However, we only had data for the spending behavior that the companies actually followed and the tax liabilities that they actually incurred, so we could only measure the actual marginal incentive that companies received from the credit. Our findings concerning the stimulative effect of the credit assume that the actual benefits companies received closely approximated the benefits the companies had anticipated when the decision to undertake spending was made.

Estimating the Increase in Spending Due to the Credit

The estimated effective rates of credit shown in table IV.1 represent percentage reductions in the price of R&E inputs due to the credit. In this section, we explain how we combined these estimates with measures of corporate responsiveness to price incentives so as to estimate the credit's impact on aggregate R&E spending.

Determining the Responsiveness of Corporate R&E Spending to the Credit's Incentive

The economic literature on the determinants of corporate spending for R&D consists of studies that model the production decisions of firms as either a profit maximization or cost minimization problem. The production functions in such models normally include labor, capital, and R&D as inputs. Separate functions specify the determinants of a company's demands for these inputs. The R&D demand functions include the price of R&D as a determinant. The coefficient for this price variable is the price elasticity of research expenditures; it shows the percentage increase in R&D spending in response to each percentage decrease in the price of R&D.

In a detailed review of the R&D determinants literature, Charles River Associates (1985) noted that the principal differences among the empirical studies lie in the varying degrees of sophistication of their models. The review concluded with the following assessment:

"In summary, most of these models have estimated long-run price elasticities of demand for R&D on the order of -0.2 to -0.5. While all of these results are plausible, if forced to choose among them we would select the recent estimates of Bernstein and Nadiri (1984) of -.0278 (short run) and -.2133 (intermediate and long run) as our estimates of the own price elasticities of demand for investment in R&D. This is because they use the most sophisticated and intuitively appealing methodology, taking explicit account of both adjustment costs and appropriability problems. However, all of the above estimates are prone to aggregation problems and measurement errors in the explanatory variables."[4]

Other economists familiar with the literature agree with the assessment that the best estimates of the price elasticity fall between -0.2 and -0.5.[5] Limited dissent comes from Baily and Lawrence (1985), who tested three models and obtained elasticity estimates of -0.2, -0.3 and -1.2. The model that yielded the third estimate, however, was derived from a very simple model that employed aggregate rather than firm-level data and constrained the price and output elasticities of R&D to be equal.

In addition to affecting corporate behavior through the price mechanism, the R&E credit may have a small effect on the spending behavior of some types of companies by increasing their cash flows. Charles River Associates argues that, while economic reasoning and the available empirical evidence support the conclusion that a cash flow increase due to the credit will have no effect on the R&D expenditures of most firms, it is possible that some companies that are already devoting a large proportion of their available resources to R&D may be influenced by a cash flow increase. The R&D expenditures of large companies, which are the predominant users of the credit, are not likely to be influenced by the cash-flow effect of the credit. However, the spending of small, cash-constrained companies may be affected. We did not attempt to include any cash-flow effect in our analysis, but we recognize this issue as one reason for being cautious about generalizing our findings to small companies.

[4]Charles River Associates (1985), p. G-14.

[5]See Mansfield (1986), p. 191 and Gravelle (1985), pp. 27-29. An economist with the National Science Foundation whom we interviewed also agreed with this assessment.

Determining the Percentage Increase in Spending Each Year Due to the Credit

The short-run price elasticity measures the immediate response of corporate spending to a change in price. Therefore, to estimate the percentage change in expenditures in 1981 that can be attributed to the credit, we multiplied our estimate of the weighted average effective rate of credit for 1981 by the negative of the short-run elasticity value of -.028. We refer to this rate of growth as:[6]

$g81 = \underline{ERC81} \times .028.$

We assumed that during 1982 and 1983 companies were moving toward their long-term, or equilibrium, response to the credit, and that by 1984, aggregate spending had fully adjusted in response to the marginal credit benefit that the average company expected to receive. We assumed that this average expected marginal benefit is constant over time and can best be approximated as:[7]

$\underline{ERC82,3} = (\underline{ERC82} + \underline{ERC83}) / 2.$

For the later years in our time frame, 1984 and 1985, we determined the percentage by which aggregate research expenditures were higher due to the credit as follows:

$g84,5 = \underline{ERC82,3} \times (-1)$long-run elasticity.

For the transitional years, 1982 and 1983, we assumed that

$g82 = g81 + (g84,5 - g81)/3$, and

$g83 = g81 + 2(g84,5 - g81)/3.$

We estimated this expenditure growth using several alternative values for the long-run elasticity, ranging between -.2 and -.5.

Determining the Amount of Spending Stimulated by the Credit Each Year

To estimate the amount of spending stimulated by the credit in 1981 (G81), we used the following relationships among total actual spending on qualified research in 1981 (TE81), the total spending that would have occurred in the absence of the credit (PE81), and g81:

[6]In the formulas that follow, underlining indicates that a term refers to a weighted average value.

[7]We excluded ERC81 from this average because of its transitional nature.

TE81 = (1+g81)PE81.

PE81 = TE81 / (1+g81).

G81 = g81 x PE81 = g81 x TE81 / (1+g81).

We estimated the amount of spending stimulated in later years in a similar manner.

G82 = g82 x PE82.

G83 = g83 x PE83.

G84 = g84,5 x PE84.

G85 = g84,5 x PE85.

Before calculating G81 through G85, we had to estimate TE81 through TE85. SOI estimates the aggregate amount of qualified spending that is reported on forms 6765 each year. However it does not estimate the amount spent by corporations that do not file a form 6765 for that year. Since we had estimated the spending of our sample corporations when they did not file for the credit, we could compute the ratio of total sample spending over total sample reported spending for each year. We estimated TE81 through TE85 by multiplying SOI's estimates of aggregate reported spending each year by the ratio of total spending to reported spending from our sample for that year. Table IV.2 presents a comparison between our estimates of total qualified research spending and the NSF's estimates of total corporate R&D spending. The table also presents our estimates of the credit's revenue cost for each year. We obtained the revenue cost estimate for each year by multiplying SOI's estimate of the amount of credit claimed against current tax liabilities by our sample ratio of the amount claimed against current liabilities or carried back over the amount claimed against current liabilities.

Table IV.2: Estimates of the Aggregate Revenue Cost of the R&E Credit and Aggregate Qualified Research Spending, 1981-1985 (Dollars in Billions)

	1980	1981	1982	1983	1984	1985	Total 1981-1985
Estimated revenue cost of the credit[a]	$ —	$.8	$1.2	$1.5	$1.8	$1.7	$7.0
Estimated qualified research spending[b]	18.5	24.4	28.1	30.4	34.2	37.6	154.7
Research spending reported by NSF	30.4	35.4	39.5	42.9	48.3	51.7	217.8
Ratio of qualified research spending to spending reported by NSF	0.607	0.689	0.712	0.709	0.708	0.727	0.710

[a]These are estimates of the amounts of credit used against current liabilities, plus the amounts of excess credit carried back to offset prior-year liabilities.

[b]These are estimates of the amounts spent by all corporations, whether or not they filed forms 6765. The 1981 amount represents full year spending, even though spending before July 1, 1981, did not qualify for the credit.

Determining the Spending Stimulated Per Dollar of Revenue Cost

By summing G81 through G85, we obtained an estimate of the total amount of spending stimulated by the credit from 1981 through 1985. To determine the spending stimulated per dollar of revenue cost, we simply divided the amount of spending stimulated by our estimate of the total revenue cost of the credit for the same period. Our results are sensitive to changes in our assumed values for the long-run price elasticity and the discount rate. We believe that a price elasticity of -.35 (the midpoint in the range of accepted estimates) and a discount rate of 12 percent are reasonable assumptions, but other combinations of values for these parameters are plausible. Table IV.3 presents the estimates of both the total amount of spending stimulated and the amount stimulated per dollar of revenue cost that we obtained using a range of alternative values for the parameters.

Table IV.3: The Amount of Qualified Research Spending Stimulated by the R&E Credit, 1981-1985

Parameter assumptions	Amount of qualified research stimulated by the credit	Amount stimulated per $ of credit claimed
Discount rate=.09		
Price elasticity = -.2	$860	$.12
Price elasticity = -.35	1,473	.21
Price elasticity = -.5	2,092	.30
Discount rate=.12		
Price elasticity = -.2	1,025	.15
Price elasticity = -.35	1,764	.25
Price elasticity = -.5	2,513	.36
Discount rate=.15		
Price elasticity = -.2	1,180	.17
Price elasticity = -.35	2,039	.29
Price elasticity = -.5	2,911	.42

Source: GAO analysis of a subset of 800 corporations from SOI's annual samples of corporate income tax returns

Evaluating SEC Data as a Proxy for Tax Data

Our analysis was limited in scope because data were not available on qualified research spending past 1985. We explored the possibility of using research spending data from SEC to extend our time series through 1987. However, because of year-to-year discrepancies, we concluded that the SEC data were not suitable for our analysis.

Companies with securities listed on national security exchanges and certain companies with securities traded over the counter are required to file 10-K forms with the SEC each year. Companies that file these forms are instructed to estimate the amount that they have spent on R&D for that year, if such spending is "material." The R&D spending that a company reports to SEC can differ significantly from the amount of qualified research spending that the same company claims on its form 6765. Most notably, the amounts reported to the SEC can include overseas R&D spending as well as spending on engineering and routine technical services that would not qualify for the R&E credit.

Data reported to SEC are included in McGraw-Hill's COMPUSTAT database. COMPUSTAT contains financial data for over 6,000 companies for over 20 years, ending with 1987. We tried to match the tax data records for our sample of 800 corporations with the COMPUSTAT data records for the same corporations. We identified 219 corporations that had complete time series of both qualified research spending and R&D spending

contained in COMPUSTAT. A comparison of the two measures of spending for these corporations showed that from 1980 through 1985, qualified spending grew 1.04 times as rapidly as R&D spending. For individual years during that period, however, the rates of spending growth differed markedly. Between 1980 and 1981, for example, qualified spending grew 1.46 times as rapidly as R&D spending, while between 1983 and 1984 it grew only .72 times as rapidly.

To demonstrate how the year-by-year discrepancies in spending growth rates could distort estimates of the effective rate of credit, we computed weighted average effective rates for 1981 through 1983, using the separate measures of spending. We found that while the 1981 estimates were nearly the same whether we used tax data or COMPUSTAT data, the 1982 estimate that was based on tax data was more than 70 percent higher than the 1982 estimate that was based on SEC data. The 1983 tax estimate was almost 30 percent lower than our estimate using the 1983 COMPUSTAT data. We concluded from these results that the COMPUSTAT data were a poor proxy for tax data when estimating effective rates of credit.

A Comparison of the Proposed Credit With Revenue Equivalent Single-Rate Credits

The purpose of this appendix is to describe in more detail three points: (1) both the effective rate and the revenue cost of the proposed credit would depend on the distribution of spending across corporations (ranked according to their spending growth rates); (2) the rate at which a single-rate credit would have to be set in order to cost no more revenue than the proposed credit would also depend on the distribution of spending; and (3) for a wide range of distributions, a revenue-equivalent, single-rate credit would provide a lower average incentive than the proposed credit.

In table V.1, we present comparisons between the proposed credit and single-rate credits for four possible spending distributions. Case 1 shows that if the distribution were similar to what it was in 1985, the weighted average marginal rate of the proposed credit would be 16.4 percent and the cost per $100 of spending would be $4.40. The revenue-equivalent average marginal rate of a single-rate credit in this case would be 10.8 percent. If the spending distribution were shifted more to corporations with rapidly growing expenditures, as in cases 2 and 3, the average marginal rates and revenue costs of both the proposed and revenue-equivalent single-rate credits would be higher. In both cases, however, the average marginal rate of the single-rate credit would be lower than that of the proposed credit. Case 4 demonstrates that if a larger share of total spending were to be done by corporations in which spending grew slowly, the revenue cost and incentives provided by both credits would be lower and the incentive provided by the single-rate credit would still be lower than that of the proposed credit. In these examples, changes in the effective rate of credit resulted from changes in the distribution of spending, rather than the reverse.

Table V.1: Computation of Weighted Average Marginal Rates of Credit and Revenue Costs Per $100 of Expenditures for Alternative Credits

Case 1—1985 Distribution

Growth group	Group share of total spending	Group's average rate of growth in spending	Proposed credit		Single-rate credit	
			Marginal rates	Cost per $100 of spending	Marginal rates	Cost per $100 of spending
1	1.0%	-42.0%	0.0%	$0.00	00.0%	$0.00
2	23.0	0.0	7.0	0.40	10.9	0.63
3	72.0	33.0	20.0	3.60	10.9	3.43
4	4.0	210.0	10.0	0.40	10.9	0.33
Weighted average		32.0%	16.4%		10.8%	
Total				**$4.40**		**$4.39**

Case 2—Distribution Moderately Higher Than 1985

Growth group	Group share of total spending	Group's average rate of growth in spending	Proposed credit		Single-rate credit	
			Marginal rates	Cost per $100 of spending	Marginal rates	Cost per $100 of spending
1	0.5%	−40.0%	0.0%	$0.00	00.0%	$0.00
2	12.5	4.0	7.0	0.24	12.0	0.42
3	79.0	40.0	20.0	4.51	12.0	4.40
4	8.0	220.0	10.0	0.80	12.0	0.74
Weighted average		49.5%	17.5%		11.9%	
Total				**$5.56[a]**		**$5.55[a]**

Case 3—Distribution Much Higher Than 1985

Growth group	Group share of total spending	Group's average rate of growth in spending	Proposed credit		Single-rate credit	
			Marginal rates	Cost per $100 of spending	Marginal rates	Cost per $100 of spending
1	0.0%	−40.0%	0.0%	$0.00	0.0%	$0.00
2	5.0	8.0	7.0	0.11	12.6	0.19
3	75.0	45.0	20.0	4.66	12.6	4.56
4	20.0	250.0	10.0	2.00	12.6	1.98
Weighted average		84.2%	17.4%		12.6%	
Total				**$6.76[a]**		**$6.73**

Case 4—Distribution Lower Than 1985

Growth group	Group share of total spending	Group's average rate of growth in spending	Proposed credit		Single-rate credit	
			Marginal rates	Cost per $100 of spending	Marginal rates	Cost per $100 of spending
1	2.0%	−40.0%	0.0%	$0.00	0.0%	$0.00
2	50.0	-4.0	7.0	0.77	9.6	1.05
3	47.5	30.0	20.0	2.19	9.6	1.93
4	0.5	200.0	10.0	0.05	9.6	0.04
Weighted average		12.4%	13.1%		9.4%	
Total				**$3.01**		**$3.02**

[a]Totals may not add due to rounding.

Notes:

1. Definition of growth groups:
   1: current spending ≦ 75% of base.
   2: 75% of base current spending ≦ 113.5% of base.
   3: 113.5% of base current spending ≦ 200% of base.
   4: current spending 200% of base.

2. The distribution of expenditures shown for case 1 are based roughly on 1985 data for our sample of 800 corpora

3. The average rate of growth for each growth group is the average over all companies within the group, with each company's rate weighted by its share of the group's spending. The rates shown in case 1 are based roughly on 1985 data for our sample of corporations.

4. The weighted average marginal rates were computed by weighting the marginal rate for each group by that group's share of total spending.

5. The revenue cost per $100 of expenditures was computed as follows:

a. Out of every $100 of aggregate expenditures, GG1% is spent by companies in growth group 1, GG2% is spent by companies in growth group 2, etc. These percentages are shown in column two.

b. Each group's share of aggregate base expenditures, which we label B_i, can be computed as : $B_i = GG_i\% / (1 + AG_i)$, where AG_i is the group's weighted average growth rate. The AG_i are shown in column three.

c. The revenue cost per $100 of spending for the proposed credit is thus:

(GG1% - B1) x 0 =	0
(GG2% - .75xB2) x .07 =	x_2
(GG3% - B3) x .2 =	x_3
(GG4% - B4) x .1 =	x_4
	sum = total cost per $100.

where X_2 shows the share of the total cost that goes to group 2, X_3 shows the share to group 3, etc. These shares are shown in column five.

d. The revenue cost per $100 of spending for the single-rate credit is thus:

(GG1% - B1) x 0 =	0
(GG2% - .75xB2) x single rate =	x_2
(GG3% - .75xB3) x single rate =	x_3
(GG4% - .75xB4) x single rate =	x_4
	sum = total cost per $100.

6. The effective rate and revenue cost comparisons presented in this appendix do not take into account the section 174 adjustment. This adjustment would reduce all of the nonzero rates and costs by 17 percent.

Details of a Modification to the Proposed Credit

In this appendix, we explain how the computation of the proposed credit would have to be modified in order to produce the rate structure presented in figure 4.3. We also use a hypothetical example to show how this modification would differ from raising the minimum base limitation from 50 percent to 75 percent as a revenue-saving measure. Finally, we briefly explain how we estimate that the modification could save between $78 and $103 million in 1990.

Taxpayer Computations

Basically, the modification would increase the base used for the regular credit computation by 2 percent without giving many more taxpayers an incentive to choose the alternative credit computation instead. Under the modification, a taxpayer would be allowed to choose between the two following computations:

(1) C = .07 x (QS - .75 x BASE), but not to exceed .028 x BASE;

(2) C = .2 x (QS - 1.02 x BASE),

where C = the amount of credit, QS = current qualified spending, and BASE = the regular base for the proposed credit. Whatever choice the taxpayer made, his/her credit would be equal to the lesser of C or 10 percent of QS. This last constraint would be a means of retaining the 50-percent limitation.

Option 1 is equivalent to the alternative computation of the proposed credit, except that there is a ceiling on the amount of credit that a taxpayer could earn. The purpose of this ceiling is to make the option less attractive to taxpayers who could qualify for the regular credit. Option 2 is equivalent to the regular computation of the proposed credit, except that the base would be 2 percent higher.

The following example demonstrates how the base adjustment described above would differ from a 75-percent base limitation. Suppose that a company would spend $135 on qualified research in the absence of any credit. Suppose further that this company's fixed base under the proposed credit would be $100 and that the marginal incentive of that credit would encourage the company to increase its spending to $150. The first column in table VI.1 shows that this company would earn $5.81 of credit for spending that it would have done anyway, it would earn $2.49 of credit for its true additional spending (the spending above its ideal base), and it would receive a marginal incentive of 16.6 percent. If a 75-percent base limit is imposed, the company's "undeserved" credit

would be reduced from $5.81 to $5.60, while the credit it really "deserves" would fall from $2.49 to $.63. The marginal incentive provided to the company would be dramatically cut to 4.2 percent. In contrast, the 2-percent base adjustment would not affect this company's marginal incentive nor the amount of credit that the company earned for its true additional spending. The adjustment would, however, reduce the company's undeserved credit from $5.81 to $5.48. The 75-percent limit would save much more revenue than the 2-percent base adjustment but at the cost of greatly reducing the credit's effectiveness.

Table VI.1: A Comparison Between the 75-Percent Base and the 2-Percent Base Adjustment

	Proposed credit	Proposed credit with 75% base limit	Proposed credit with 2% base adjustment
Credit for spending that company would have done anyway	$5.81[a]	$5.60[b]	$5.48[c]
Credit for true additional spending	2.49[d]	.63[e]	2.49[f]
Total credit earned	**$8.30**	**$6.23**	**$7.97**
Revenue saving compared to proposed credit	0	$2.07	$.33
Marginal incentive	16.6%[g]	4.2%[h]	16.6%[g]

Note: These computations are for a company with a statutory base equal to $100, an ideal base equal to $135, and current spending equal to $150.

[a] .2(135-100)(1-.17)

[b] .2(135-.75x135)(1-.17)

[c] .2(135-102)(1-.17)

[d] .2(150-100)(1-.17)=5.81

[e] .2(150-.75x150)(1-.17)=5.60

[f] .2(150-102)(1-.17)=5.48

[g] .2(1-.17)

[h] .2(1-.75)(1-.17)

Estimating the Revenue the Modification Would Save

The modification described above would reduce the credit earned by each company in which spending was at least 17 percent above base by an amount equal to $.20 x .02 x the company's base spending. To estimate the total revenue savings for a particular year, one needs to estimate the sum of the fixed base amounts for all companies in which spending was at least 17 percent above base.

If aggregate qualified research spending were to grow at an annual rate of 10 percent from 1985 through 1990 (a little less rapidly than it grew during the early 1980s), and if the distribution of spending across growth rates in 1990 were similar to the distribution depicted in figure 4.2, then total base spending by companies in the 17-percent-plus group would equal approximately $27 billion. If the annual growth rate were 8 percent, instead, and the distribution were slightly more to the left, then the base spending figure would be about $23.5 billion. A growth rate of 12 percent and a distribution slightly more to the right would lead to a base spending figure of about $31 billion.

Base spending of $23.5 billion by the 17-percent-plus group in 1990 would imply a revenue savings of about $78 million after the section 174 adjustment ($.20 x .02 x 23.5 billion x (1 - .17)). Base spending of $31 billion would imply a revenue savings of about $103 million. If qualified spending grows at least as rapidly as GNP does after 1990, and if the distribution of spending does not shift to the left (and it is not likely to shift to the left if spending and GNP grow at the same rate), then the revenue savings will also grow at least as rapidly as GNP does.

A Bibliography on the R&E Tax Credit With Comments on Some Prior Studies

The bibliography in this appendix encompasses studies relating to the effectiveness of the R&E credit, the price elasticity of demand for R&D, and the private and social rates of return to R&D. To place our study in the context of others' work, we briefly summarize the nature and results of prior analyses of the credit's effectiveness. (See Charles River Associates [1985] and Baily and Lawrence [1987] for more extensive reviews of earlier work in this field.)

Other Studies of the Credit's Effectiveness Have Produced Mixed Results

Many attempts have been made to estimate the effectiveness of the R&E credit. Because most researchers have lacked access to the confidential taxpayer data necessary for accurately estimating the stimulus provided by the credit, their estimates have inherent limitations. Several studies employing time series of aggregate R&D spending data have shown that these expenditures have increased significantly since the credit came into effect in 1981.[1] These analyses did not accurately measure the impact of the credit, however, since they did not isolate the credit's influence from that of other possible stimulants. A widely cited survey of corporate officials indicated that, in the absence of the credit, corporate research spending would have been 0.4 percent less in 1981, 1.0 percent less in 1982, and 1.2 percent less in 1983.[2] Although these findings have been questioned because the respondents had an interest in promoting the credit, they are roughly consistent with our results.

Some economists have computed effective rates for the credit using research spending data taken from the 10-K forms that corporations file with the SEC.[3] In appendix IV, we explain why we concluded that these data are an inaccurate proxy for qualified research expenditures for the purpose of estimating effective rates. In a recent study, Altshuler (1988) did use corporate taxpayer data to estimate an average effective rate of credit for 1981. She used a computational method and a discount rate that differed from ours. Her estimate of 2.3 percent for the 1981 effective rate is consistent with the low range of our estimates for that year.

Finally, Treasury has predicted what the amount of spending stimulated per dollar of revenue cost would be for both the current and proposed credits if they were to be in effect from fiscal years 1989 through 1993.[4]

[1]See Baily and Lawrence (1985 and 1987), Brown (1985), and Mansfield (1985).

[2]See Mansfield (1985).

[3]See Charles River Associates (1985) and Dworin and Grubert (1987).

[4]See Ross (1988).

Given the changes in the tax code that have been made since the time frame of our analysis, Treasury's prediction of $.20 for the amount stimulated per dollar of credit for an extension of the current credit is consistent with our estimated range of $.15 to $.36 for the earlier version of the credit. We have explained why we believe that predictions of the amount stimulated per dollar of credit for the proposed credit are necessarily subject to large errors. We do, however, believe that Treasury's predictions of $1.21 for the amount stimulated per dollar of credit under the congressional proposal and $1.11 for the administration proposal are plausible.

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